APRIL 26, 1945

American Machinist

TECHNOLOGY DEPT
APR 27 1945
DETROIT

Hot-Forming Method
Used on Magnesium-Alloy Sheets

•

New Technique in Gage Control
Raises Efficiency

•

Roller Leveling
In Rubber Press Department

•

Automatic Carbon Arc Welding
Advantageous for Aluminum

Honing
Precision
Parts

HEALD No. 72A TWO SPINDLE GRINDING MACHINE

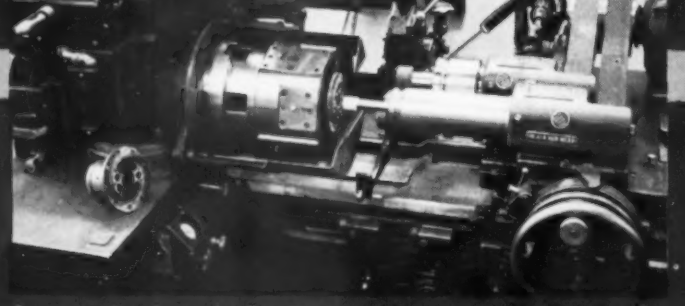
Lower Costs

Minimum Scrap

Squareness of Hole with Face

Greater Production

Fewer Set-Ups



Four operations in one loading. The bore is ground with the front head. The adjacent face is plunged with the rear head. The external rabbet diameter is ground, also with the rear head, after which the flange face is finished in the fourth step.

GIVES YOU ALL FIVE!

IF MANAGEMENT ASKED YOU to name the result most needed in your shop—what would you say? Chances are it would be *one* of the advantages cited here. But, put Heald 2-Spindle Grinding Machines on the job, and you can deliver *all five!*

HERE'S HOW

This two spindle Heald Machine makes it possible to finish several surfaces in one set-up—to grind bores, external surfaces and face front and adjacent surfaces. By selecting the correct size and properly arranging the two spindles, an endless combination of these operations can be handled.

HERE'S WHY

With these multiple operations you get multiple results—each of which is measurable in dollars. Add them up: Increased production because you're completing a number of operations at one loading. Better accuracy *including perfect squareness and exact parallelism* because the same locating surfaces are used for all operations. Minimum scrap because of machine control with less handling. Lower unit costs because of fewer set-ups and increased output from one machine as compared to individual machines for each operation.

We at Heald would welcome the opportunity of working with you in uncovering jobs which can be done faster and better on this machine.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

HEALD

more precision ...less cost!

American Machinist

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DETROIT

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American Machinist Chips

In This Issue . . . Along with the great developments in precision manufacture, the matter of accurate measuring has gained more and more importance. Consequently, we believe most of our readers will be interested in the lead article of this issue which describes a practical, efficient method of gage control.

Also ranking high is the article on honing by W. A. Harris Jr., Chief Engineer of Micromatic Hone Corporation. He discusses rigid- and swivel-type fixtures used in honing precision parts.

Automatic carbon arc welding has long been used in steel fabrication. Its use in aluminum, however, is quite new and we believe you will find it worthwhile to read the article in this issue describing the process . . . which promises to widen the field of use of aluminum and its alloys.

Trundle Talks . . . In the latest issue of his series of vest pocket booklets on business philosophy, George Trundle Jr. crusades in the interest of "irrigating" some of the so-called industrially backward areas in the South and West. He suggests that well-established companies, making traditionally accepted trade-marked consumer products put branch plants and introduce payrolls into the sections of the United States that industry now considers poor market districts.

Under such a decentralization program, he believes that: 1. Labor would stay near at home and not migrate in such numbers into large cities; 2. People would have greater living stability; 3. More people would own their own homes; 4. We would be creating our new postwar markets in the same sense that irrigation creates, out of the desert, areas of abundance and fertility.

Swami . . . In a request received for rates and other data, the business department of *American Machinist* noticed with some surprise the following paragraph:

"Assuming acceptance from Human Relations Analysts & Counsellors, Mediums, Readers, Divine Healers, Philosophers & Psychologists."

We try to make our editorial content broad enough to cover all your Metal-Working problems, but it never occurred to us that readers might be interested in Spirit-Working. Or would you?

Shell Book . . . Many of you must remember the book "Artillery & Small Arms Manufacture" which covered in one volume a mass of information on shell manufacture garnered from *American Machinist's* now-famous Armament Sections.

Even though this book was printed in 1942 and has been completely out of stock for over a year, we still get occasional requests for it. (Which is one more indication, if we may say so with due modesty, of the calibre of *American Machinist* editorial content.)

The latest request comes from the War Department—and much as we hate to say it, our cupboard is bare and we can't scrape up a single copy. If any of you readers have a copy of "Artillery & Small Arms Ammunition" still hanging around and not being used, the War Department and ourselves will be most grateful if you would send it to us. We will see that it gets routed to Washington, where it is very much needed.

America Buys In . . . Newspapers recently carried an interesting item wherein a group of private investors, headed by Lehman Brothers, are working on a deal to buy for more than $3,000,000 a majority of the outstanding capital stock of the Firth-Sterling Steel Company, manufacturers of tool and die steels and carbides at McKeesport, Pa. The purchase is to be made from the English steelmakers Thomas Firth & John Brown, Ltd., of Sheffield, plus other British stockholders.

Tough Job . . . We are indebted to the Sugar Beet Products Co. of Saginaw, Mich., for permission to reprint the following item from their publication *The Digest*. If anyone feels that his working conditions today are not ideal, read these rules, written some 80 years ago by the original Carson, Pirie Scott & Company, department store of Chicago.

Store must be open from six in the morning until nine at night the year round.

Store must be kept swept; counters, base shelves and showcases dusted; lamps trimmed, filled and chimneys cleaned; pens made; windows and doors opened; a pail of water and a bucket of coal brought in before breakfast (if there is time to do so) and attend to the customers who call.

The employee who is in the habit of smoking Spanish cigars, getting shaved at the barber shop, going to dances and other places of amusement, will surely give his employer reason to be suspicious of his integrity and honesty.

Each employe must pay not less than $5.00 a year to the church and must attend Sunday school regularly.

Men employees are given one evening a week for courting and two if they attend prayer meeting.

After fourteen hours of work in the store the leisure hours should be spent mostly in reading.

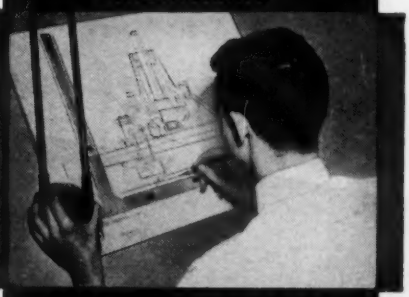
Available in Canada . . . Here is a suggestion you might pass along to your advertising manager.

A letter was recently received from Mr. Norman English, General Manager of the Vapor Car Heating Company of Canada Ltd. It said in part: *"If I may be permitted to offer a suggestion, American manufacturers might do well to follow a practice established by one of your publications. Where an advertised product is available in Canada and the advertiser is interested in developing his Canadian market, it might be worthwhile to say in the ad 'available in Canada' or to give the name of the Canadian agent."*

to help you

1 SOLVE BEVEL GEAR DESIGN PROBLEMS

BEVEL GEAR DESIGN ENGINEERING

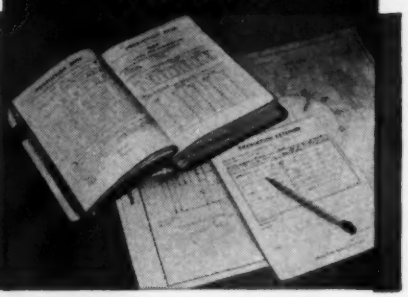


2 OBTAIN THE RIGHT EQUIPMENT FOR YOUR NEEDS

BEVEL GEAR EQUIPMENT ENGINEERING

3 ESTIMATE YOUR PRODUCTION TIME AND COSTS

BEVEL GEAR PRODUCTION ENGINEERING



the COMPLETE Gleason Engineering Service . . .

. . . when you have a problem involving bevel gear design or production, the solution can be secured from the Gleason Works—without obligation. Highly skilled engineers, backed by the company's *80 years' experience* in designing bevel gears and building bevel gear machinery, will study your bevel gear drive designs. Profitable improvements are often suggested. Correct gear cutting machines, tools and auxiliary equipment to meet your specific manufacturing requirements will be recommended. Further, we'll prepare for you estimates of production time, based upon actual shop practice. By utilizing this complete service you can save time and money.

WHAT WE NEED to help you

FOR PRODUCTION ENGINEERING

1. Blueprints of your bevel gear designs.
2. Material specifications and manufacturing tolerances.
3. Quantity of gears to be produced per month.
4. Number of working hours per month available for gear production.

FOR DESIGN ENGINEERING

1. Preliminary layouts or prints of proposed bevel gear drive designs.
2. Type of drive.
3. Horsepower and speed required.
4. Type of loading (constant, intermittent or shock).
5. Driving member and direction of rotation.

For informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears, write on your firm's letterhead.

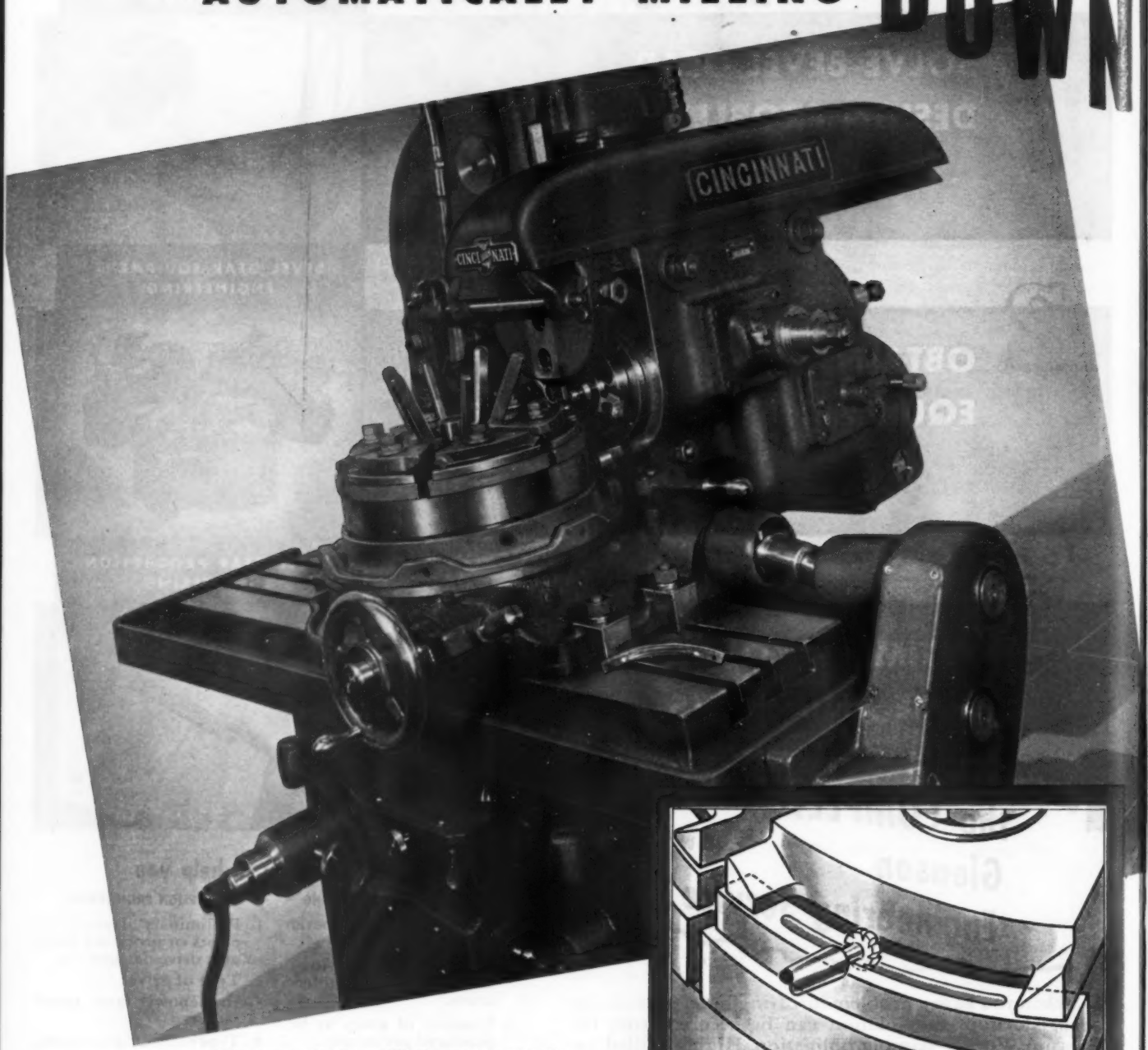
GLEASON

GLEASON WORKS

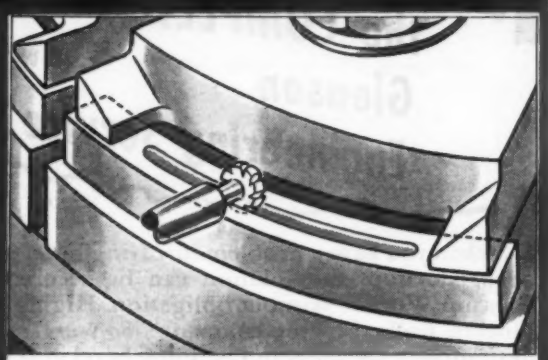
Builders of Bevel Gear Machinery for Eighty Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

AUTOMATICALLY MILLING DOWN



Close-up of the milling equipment described on the opposite page. Rods protruding from the fixture are handles of cam clamps which hold the parts in position for milling. The machine is a CINCINNATI *No. 2-24 Automatic Cam Controlled Rise and Fall Miller.*



This simplified sketch shows how the part is milled. The cam mounted on the circular milling attachment, and the roller affixed to the spindle carrier, synchronize the rise and fall of the cutter with the rotation of the attachment.

Keep on buying WAR BONDS

THE CINCINNATI M

MILLING MACHINES

AND AROUND

THEN UP INTO THE CLEAR FOR THE NEXT PART

CINCINNATI

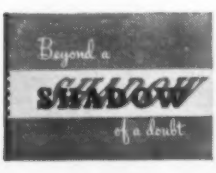
The combination of a CINCINNATI No. 2-24 Automatic Cam Controlled Rise and Fall Miller, with a Cincinnati engineered Power Feed Circular Milling Attachment and Fixture, make easy work of a tricky milling job. The operation consists of milling grooves in top and bottom of piston ring segments. All movements of the machine and attachment are synchronized, and the entire procedure is automatic and continuous. ¶ The fixture, mounted on the circular milling attachment, has six stations, and as milling progresses on one part, the operator unloads and loads each station as it comes around to his working position. This is accomplished by simply releasing and tightening the cam clamps, handles of which protrude above the fixture as shown in the illustration. There is no interruption in production. ¶ The entire setup was developed by our Application Engineers. They will be glad to talk to you about more practical and economical ways of handling your difficult milling operations.

CINCINNATI No. 2-24 Automatic Rise and Fall Miller. Catalog M-909-1, containing complete information and specifications, will be sent on request. For a brief description of this machine, look in Sweet's Catalog File for Mechanical Industries.

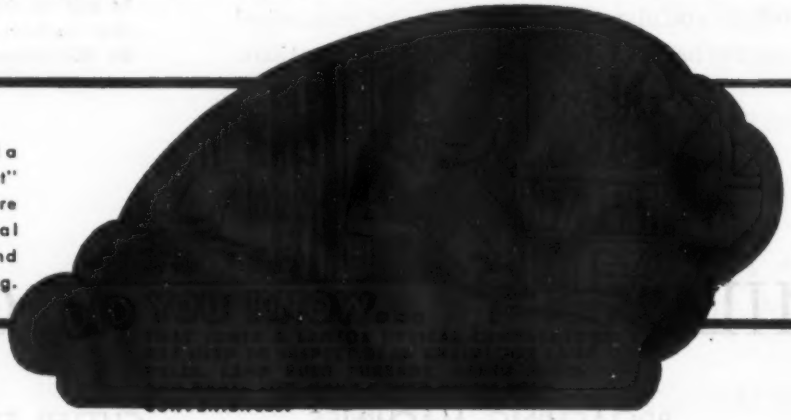
MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

Inspecting cylinder finning tools in the Wood-Ridge plant of the Wright Aeronautical Corporation. Photograph courtesy the Wright Aeronautical Corp.



This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.



WITH THE HELP OF
JONES & LAMSON *Optical Comparators*

Proper dissipation of millions of heat units from the cylinders of the 2200 H.P. Wright Cyclone 18's that power the B-29 Superfortress, depends upon the perfection of the cylinder fins. To be sure that these fins are accurate —beyond a shadow of a doubt—the tools that cut them from solid metal are inspected on Jones & Lamson Optical Comparators.

Quality control by the inspection of tools, parts and products, with Jones & Lamson Optical Comparators, is an accurate, rapid process. Objects that require hours to inspect by other means can be inspected in minutes, or even seconds.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS

STANDARD BENCH COMPARATOR

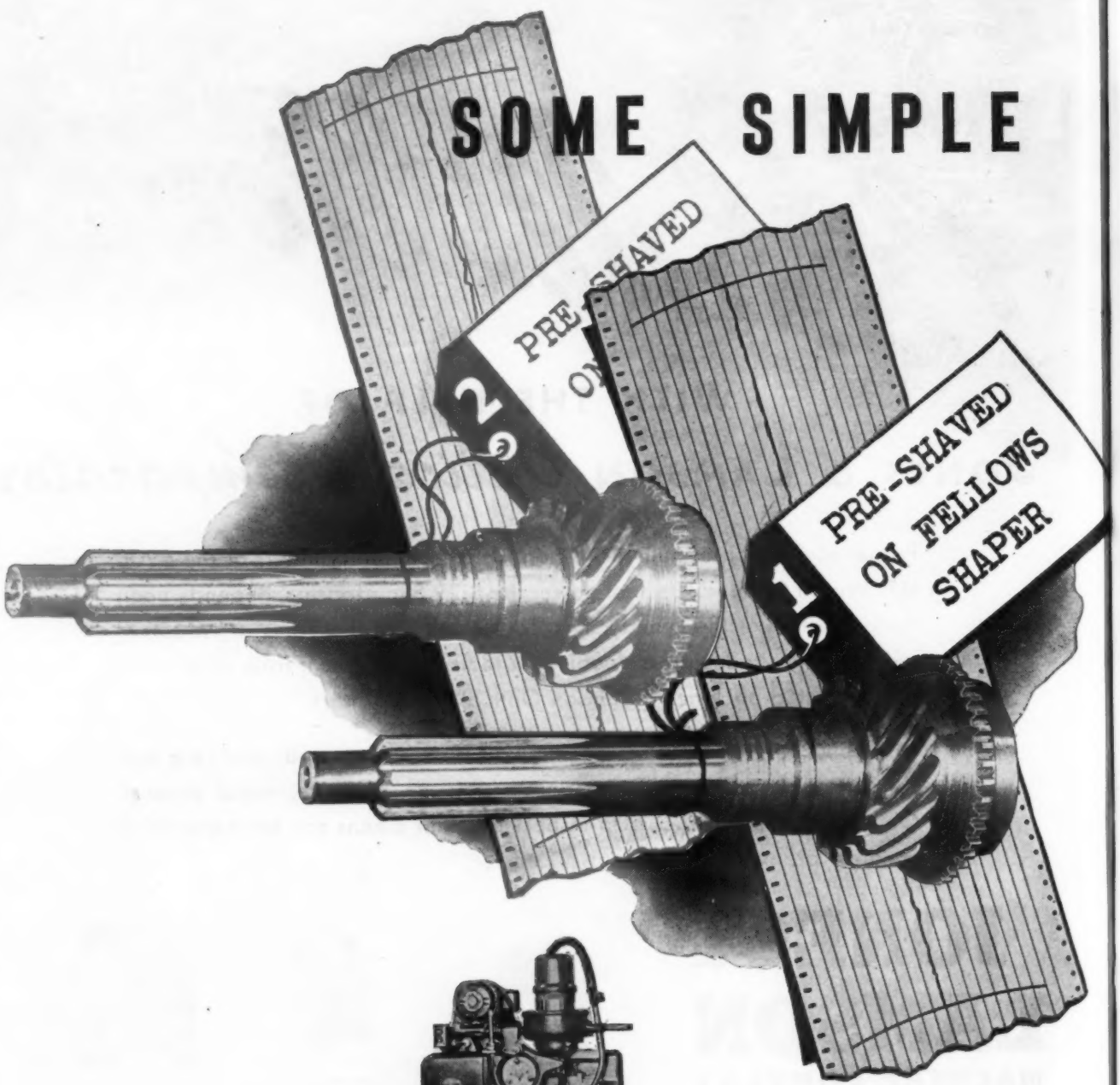
BENCH COMPARATOR 14" DIAM. SCREEN

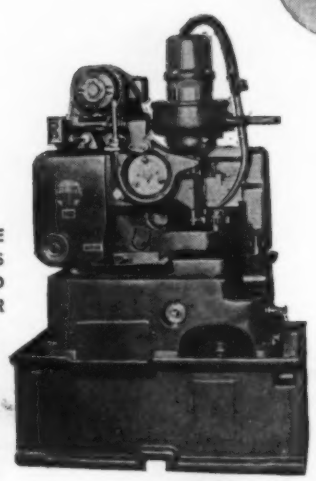
DIRECT PROJECTION COMPARATOR

STANDARD PEDESTAL COMPARATOR

PEDESTAL COMPARATOR 22"—30" DIAM. SCREENS

SOME SIMPLE L





7-TYPE
FELLOWS
HIGH SPEED
GEAR SHAPER

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

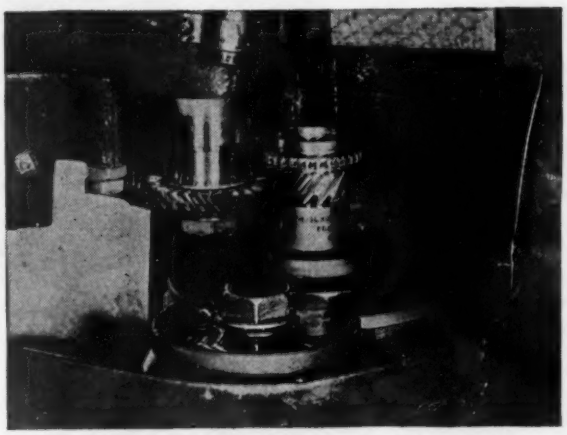
LOGIC ON Pre-Shaving OF HIGH-ACCURACY GEARS

When emphasis on high production is permitted to interfere with the necessary care and attention to the pre-shaving operation, overall costs are increased, and high-accuracy is sacrificed.

To obtain the best results, both the pre-shaving cutter, as well as the shaving tool, should in most cases be designed especially for the job. The amount of stock and its distribution on the tooth profile should be closely controlled. Variations in size in the pre-shaved gears also put an excessive load on the shaving tool, dulling it prematurely and making uniform results difficult to obtain.

Many gear manufacturers have found that the Gear Shaper and Gear Shaper Cutter presents the best and surest way to obtain satisfactory pre-shaving results.

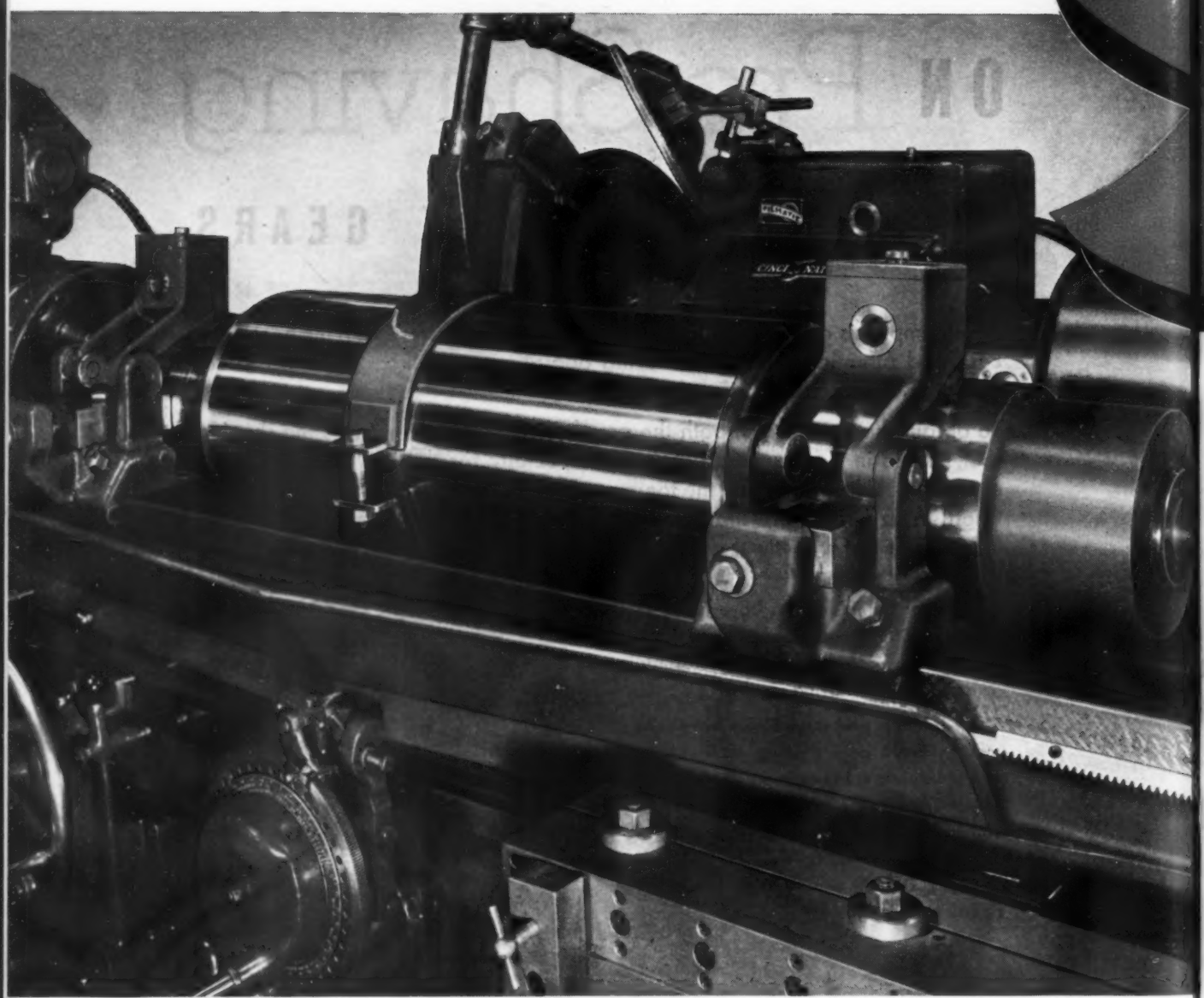
Our engineers and service men have solved many difficult gear shaving problems, and will gladly assist in helping you if given the opportunity. For further information, write The Fellows Gear Shaper Company, Springfield, Vermont, U. S. A. — or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.



For gears up to 7-inches Pitch Diameter the 7-A Type High Speed Gear Shaper answers the most exacting requirements.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



Close-up of the roll in the machine, showing journal rests and the wheel truing attachment clamped to the center of the roll (truing position). The machine is a CINCINNATI Plain Self-Contained Grinder with Swivel Table Type Roll Crowning Equipment. These machines are available in 14″ and 16″ swing sizes. Catalog G-491-1 contains complete information and specifications.

Keep on buying WAR BONDS

CINCINNATI

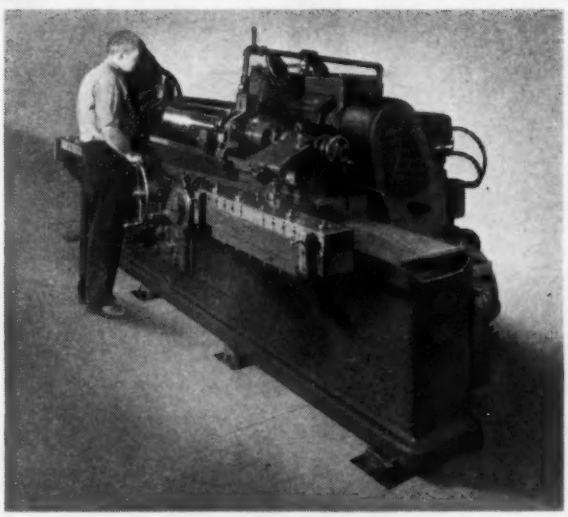
CENTER TYPE GRINDING MACHINES

THEY HAVE TO BE GOOD!

CINCINNATI

...TO CROWN ALUMINUM FOIL ROLLS

● On work like this both the machine and the man have to be mighty good. Here the operator is finish grinding the crown on an aluminum foil roll to a finish accuracy within 4 micro inches, and the ends must be the same diameter within .0001″. Ask any rolling mill operator about this class of work. He will tell you what a fussy job it is, for the roll must produce foil without blemishes or wrinkles. These exacting requirements are met fully by rolls ground on CINCINNATI Plain Self-Contained Grinders with Swivel Table Type Roll Crowning Equipment because the machine has what it takes. ¶ Perhaps this machine, with its exclusive FILMATIC bearings, may solve some of your accurate grinding problems. Our engineers will be glad to discuss it with you.



The operator combines his long experience with the inherent accuracy of a CINCINNATI *Plain Self-Contained Roll Grinder to finish crown aluminum foil rolls. Catalog G-491-1 gives complete information. Or look in Sweet's Catalog File for Mechanical Industries for a brief description of this machine.*

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

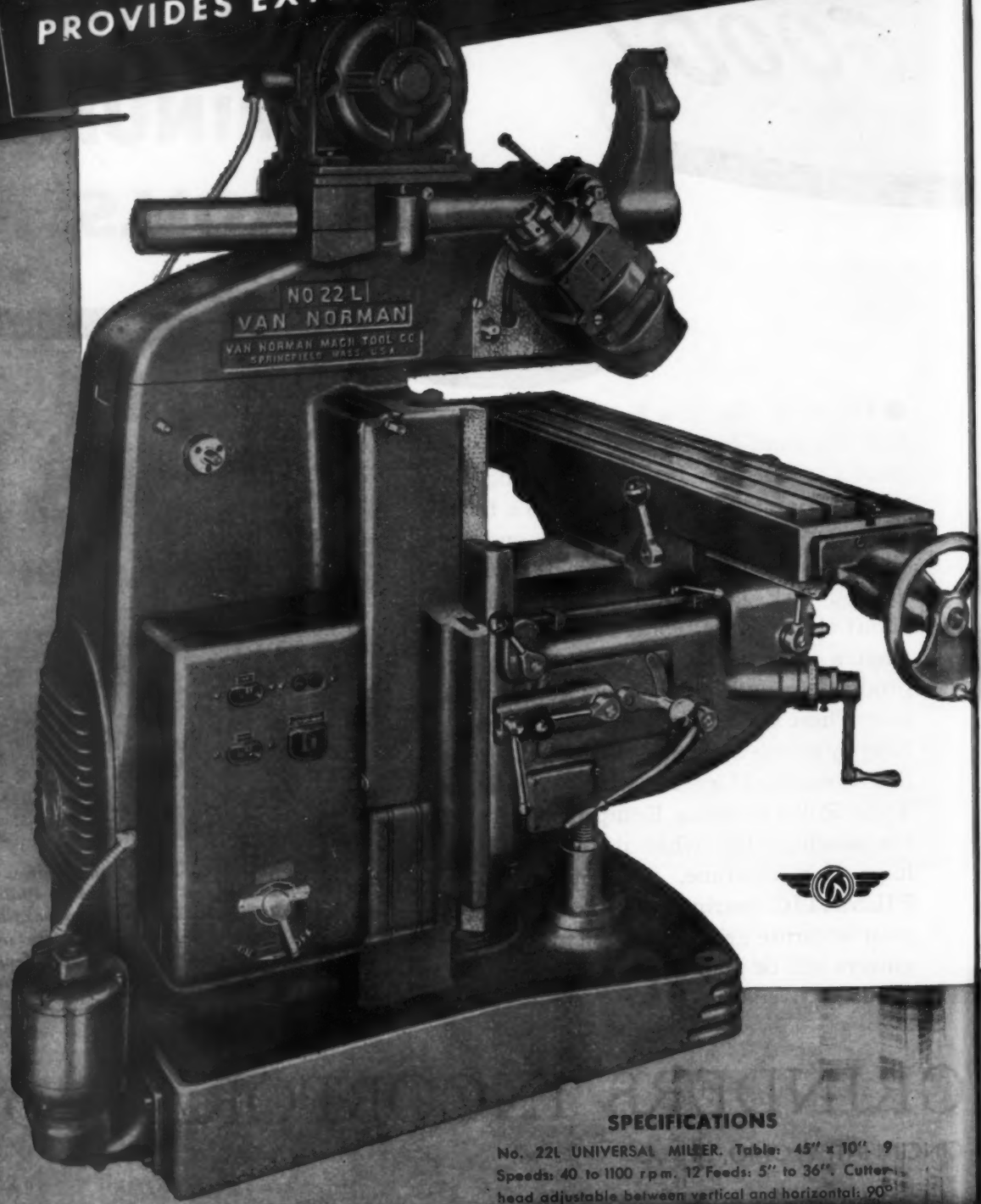
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VERSATILE CUTTERHEAD..

SAVES WORK RESET-UPS

SIMPLIFIED CONTROL..

PROVIDES EXTRA OPERATING CONVENIENCE



SPECIFICATIONS

No. 22L UNIVERSAL MILLER. Table: 45" x 10". 9 Speeds: 40 to 1100 r.p.m. 12 Feeds: 5" to 36". Cutterhead adjustable between vertical and horizontal: 90°

..on VAN NORMAN Universal Millers

The versatile cutterhead on Van Norman Ram Type Universal Millers gives you vertical, horizontal or angular milling by simply swinging the cutterhead to the desired milling position. Thus in one compact machine you have the range of several types of millers.

This Van Norman feature enables operators to complete most milling operations on a workpiece without resetting the work. In addition, there is no waiting for other types of millers to become available. The valuable time saved often increases the productive output of the machine and operator by as much as 50%. (note the typical milling applications shown below)

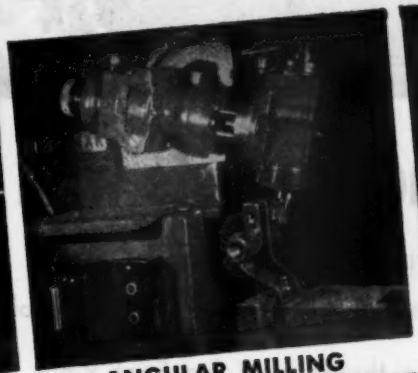
The adjustable cutterhead...combined with front and rear directional control of all power feeds for the table, knee, saddle, as well as 6-way rapid traverse... quick-change speed and feed selectors conveniently located for easy reach by the operator... and other important Van Norman Features which assure accuracy, economy and top production.

"It pays to Van Normanize"

VAN NORMAN COMPANY

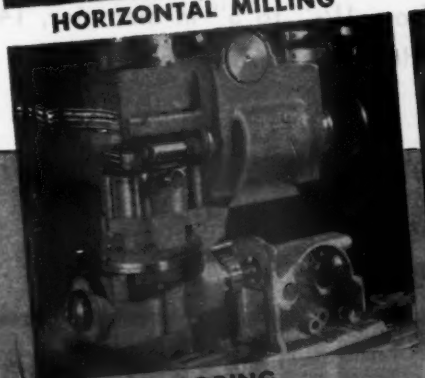
SPRINGFIELD 7, MASSACHUSETTS

HORIZONTAL MILLING



ANGULAR MILLING

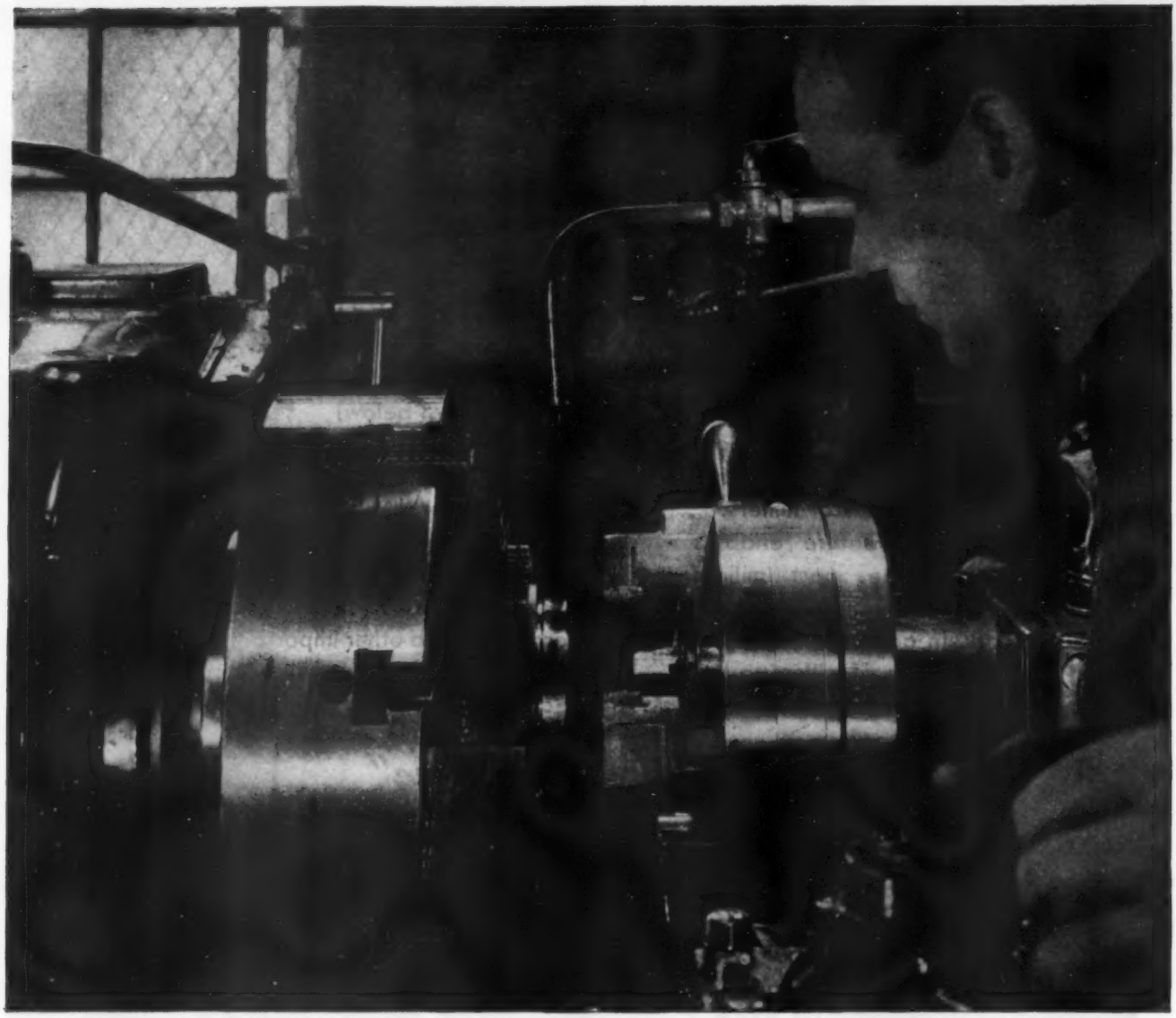
VERTICAL MILLING



BORING

SLOTTING

ANGULAR MILLING with sub head



30% Lower Threading Costs with Landmatic Heads

Cost figures show that LANDMATIC HEADS — in thousands of plants — on innumerable types of threading operations — are doing a BETTER — LOWER COST job.

The performance of these Heads in threading Valve Seat Rings for an eastern manufacturer is an example of LANDMATIC HEAD economy. Threads ranging from 1½" to 5" in diameter, 14 and 11½ threads per inch, are cut with Landmatic Heat Treated Heads at an average saving of 30% over methods previously used.

Would you be interested in seeing if substantial economies might likewise be possible in your Turret Lathe operations through use of Landmatic Heads?

Bulletin F-90 will give you detailed information

LANDIS MACHINE COMPANY

A Good Mechanic Knows and Cares For His Machine

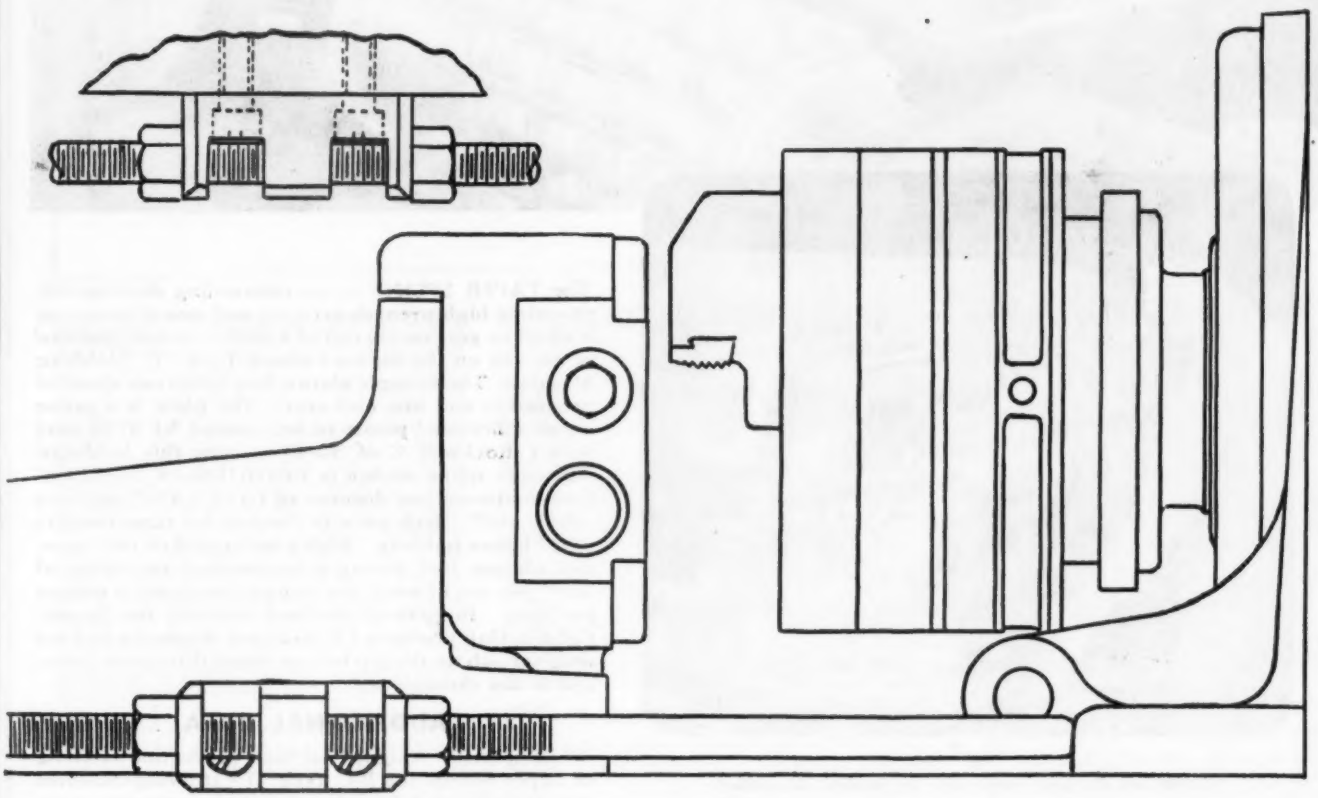
LANDIS REG. U.S. TRADE—MARK PAT. OFF. **THREAD TIPS**

In the Interest of Efficiency, Better Workmanship and Higher Production

SPECIAL CARRIAGE STOP for 1″ to 2½″ LANDMACO THREADING MACHINE

The special carriage stop can be supplied with Landmaco Machines to provide a positive stop to control the length of the turned surface, when the machine is to be used for turning and facing operations. It is not recommended for use when cutting threads.

The carriage stop can be applied to machines already in service.



Be Threadwise—Employ LANDIS Long Life Tangential Chasers

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

Low-Cost Hobbing of TAPER SPLINES *with Long Tool Life!*

On this Job, the taper spline keys are hobbed in specified relation to the pinion teeth and must line up within .001". This is controlled by a locating pin on the special work-holding sleeve, as shown in the picture.

The TAPER SPLINE — an outstanding development providing high strength, accuracy and ease of mounting a wheel or gear on the end of a shaft — *can be produced at low cost* on the Barber-Colman Type "T" Hobbing Machine. The example shown here illustrates speed of production and low tool cost. The piece is a prime mover differential pinion of heat-treated NE 8720 steel with a Rockwell C of 30–43 — note this hardness! The taper spline section is 1.6220/1.6225" O.D., 1¾" long, minimum root diameter of 1.418/1.420", and keys .404"/.406". Each piece is checked for runout within .001" before hobbing. With a hob speed of 103 r.p.m. and oblique feed having a longitudinal equivalent of .025" per rev. of work, the cutting time is *only 8 minutes per piece.* In spite of the hard material, the Barber-Colman Hob produces *120 pieces per sharpening* and the original hob on the job has cut better than 3000 pieces and is not through yet!

ADDITIONAL DATA

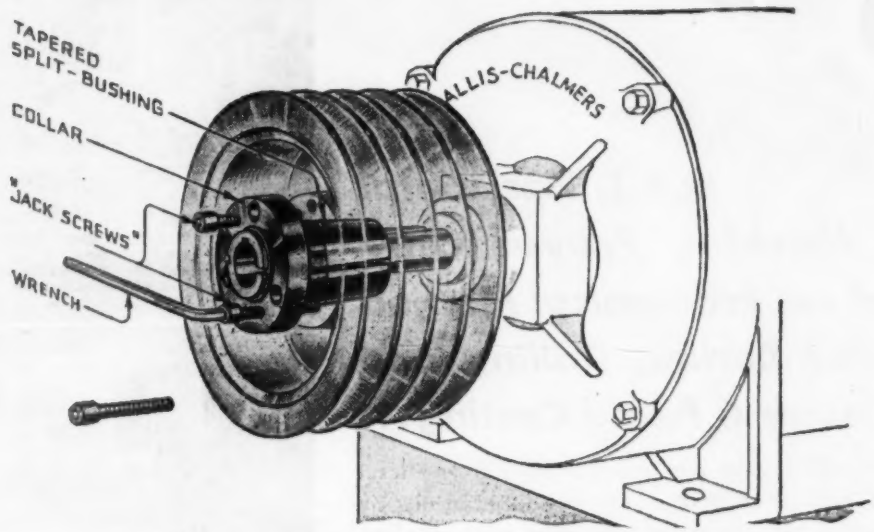
While specially designed for high production hobbing of Taper Splines the B-C Type "T" Hobbing Machine may also be used for general hobbing operations on spur gears, helical gears, worms and worm gears, and straight splines. Write for a copy of Bulletin F-1403, giving further detailed description.

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS

X-Ray View

OF ALLIS-CHALMERS' NEW "MAGIC-GRIP" SHEAVE



Fastest mounting and demounting sheave on the market, the new "Magic-Grip" costs you nothing extra.

1 **Remove three capscrews** from bushing collar. A handy wrench — supplied with each sheave — is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.

2 **Insert two capscrews** in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.

3 **Remove sheave from shaft.** Requires no mallet, no prying, no bulging muscles. You just slide the sheave off . . . smoothly, quickly. *It costs nothing extra!* Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

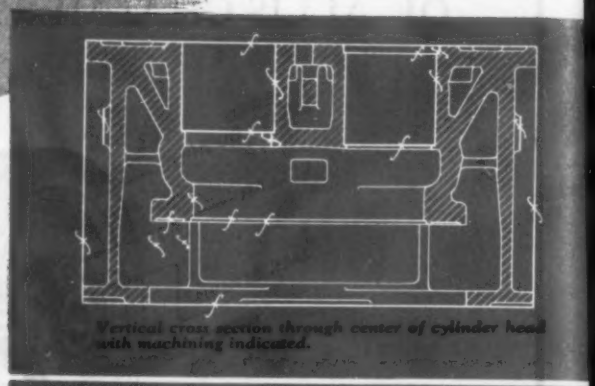
A 1770

Allis-Chalmers Texrope

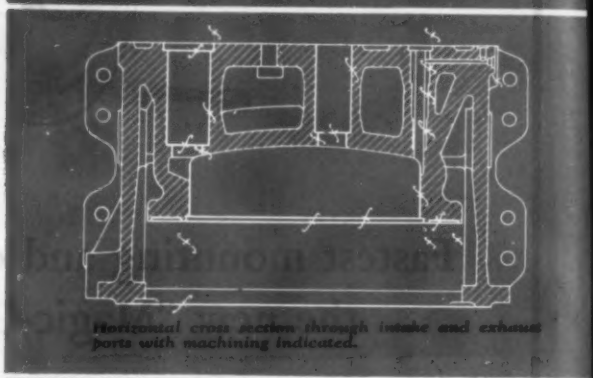
"MAGIC-GRIP" **SHEAVES**

5 TON CYLINDER HEAD SET

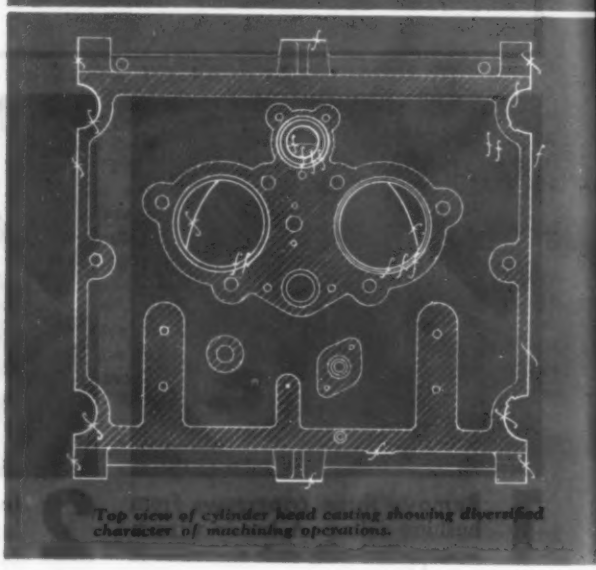
G. & L. Horizontal Boring Machine Proves Only Practical and Economical Method to Use for Boring, Drilling and Milling Huge 6 Faced Casting...



Vertical cross section through center of cylinder head with machining indicated.



Horizontal cross section through intake and exhaust ports with machining indicated.



Top view of cylinder head casting showing diversified character of machining operations.

● Here is a 10,000-lb. cast-iron Cylinder Head for a Diesel engine, requiring diversified machining operations on each of six faces. All dimensions must be held to close tolerances with tapped holes, bores and machined surfaces in correct alignment to meet assembly requirements.

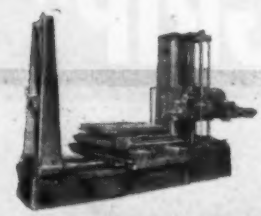
The manufacturer states that "the only practical method of doing this job is to machine it completely on the G. & L. Horizontal Boring Machine." He claims that "due to the pressure of production this cylinder head must, at times, be routed over several machines to relieve the load on the Horizontal, but nevertheless, the best and only economical method for us is to do all the work on our G. & L."

The flexibility, capacity, working range, simplicity of setting the work, accuracy, convenience of scales and verniers, micrometer dials, etc., all contribute in making the G. & L. Horizontal Boring Machine one of the most practical and economical machines in shops with large complex work.

In your own plant you may be producing work on more than one machine which can be handled faster and at less cost on a Giddings & Lewis Horizontal Boring, Drilling and Milling Machine. Our engineers will gladly assist you in analyzing and solving difficult machining problems.

GIDDINGS & LEWIS

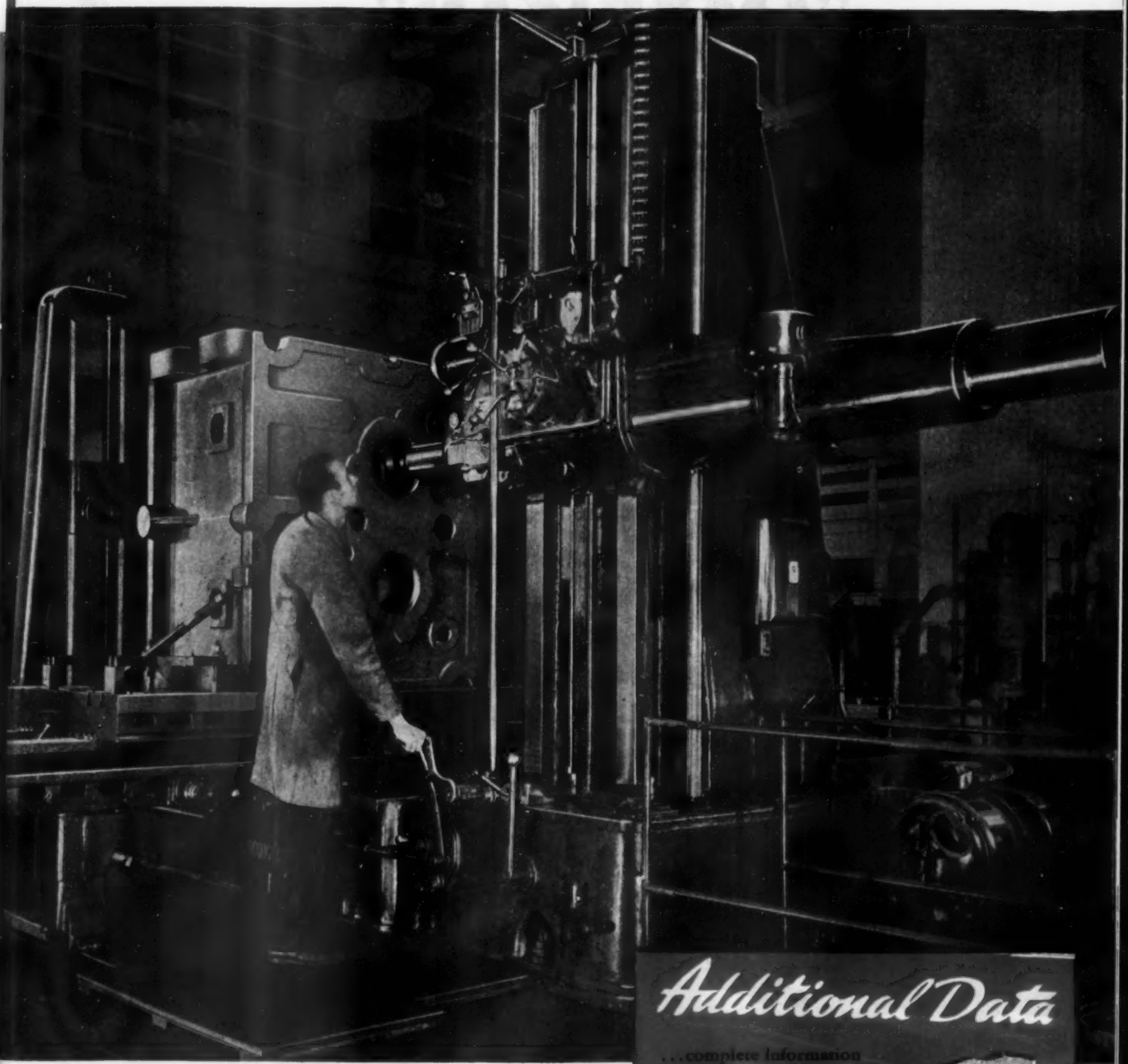
138 DOTY STREET



Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

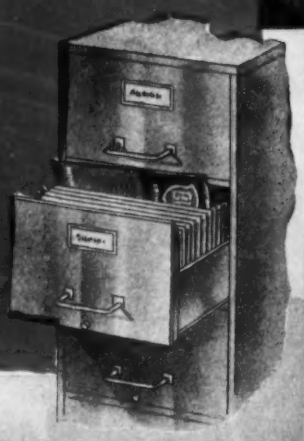
SET UP AND MACHINED IN 40 HOURS



No. 350-T G. & L. Horizontal Boring Machine with extended saddle, saddle supports and auxiliary runways used to machine 5-ton cylinder head.

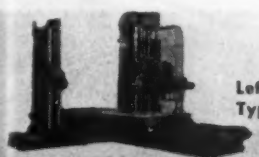
Additional Data

. . . complete information available on Giddings & Lewis machines, accessories and time-saving attachments. Write for Bulletin No. AM-45 today. Please indicate your business connection.

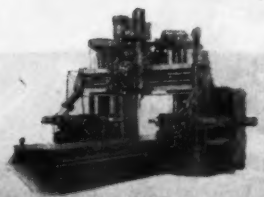


MACHINE TOOL CO.

FOND DU LAC, WIS.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

Guns by the Thousands!!

and Row upon Row of "AMERICAN" PACEMAKER LATHES

...producing them in the Plant of THE DOMINION ENGINEERING CO.

Our fighting forces need guns and more guns and they are getting them in ever increasing numbers.

In the gun plants of this country and Canada "AMERICAN" Lathes are meeting every challenge of increased schedules. They are producing as they never produced before and at the same time are maintaining amazing standards of accuracy.

For all-out production, call on "AMERICAN".

THE AMERICAN TOOL WORKS COMPANY

Lathes - Radials - Shapers

CINCINNATI, OHIO, U. S. A.

LOADING the plungers of Diesel fuel injection pumps in the 24-piece work holder of one of the Norton 10-U Lappers at American Bosch Corporation, Springfield, Mass. This is another example of Craftsmanship in the American Tradition.

with NORTON 10-U LAPPERS

BATTERIES of Norton 10-U Lappers are at work in the plants of prominent makers of fuel injection equipment for Diesel engines, producing high quality lapped injection plungers and other accurate parts of the "heart of the Diesel engine".

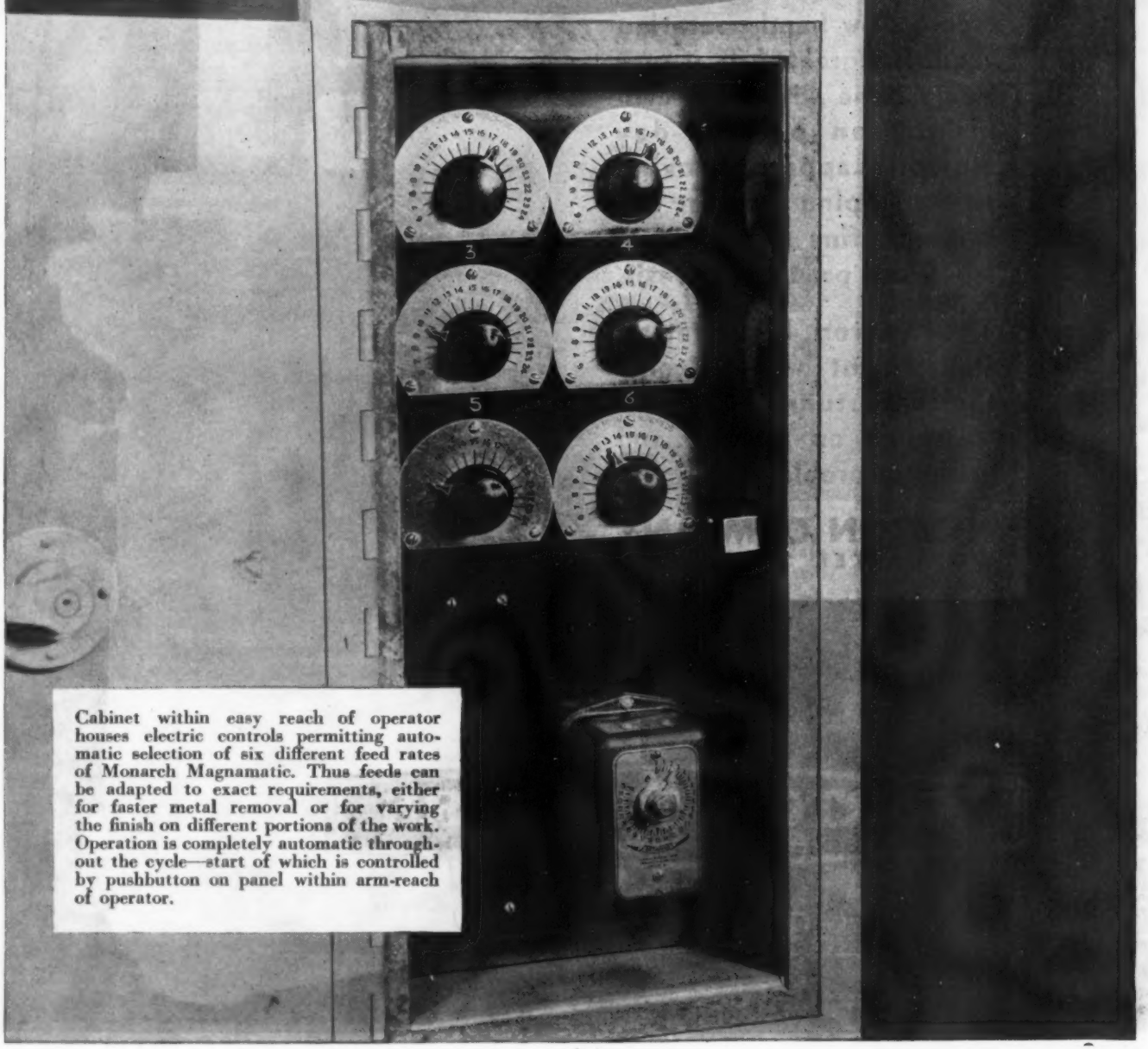
Craftsmanship becomes a greater skill when supplemented by accurate mechanical action.

Lapping, frequently considered a slow hand operation requiring great skill, is now being done with high efficiency on present-day Norton Lappers, proving that a lapping machine can produce fine surface finishes on a production basis.

The Norton Engineering Department will welcome the opportunity to work with you on lapping and grinding problems.

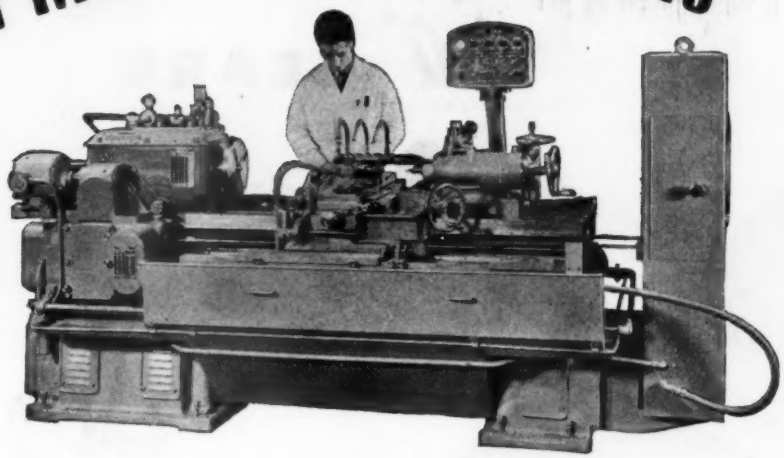
NORTON COMPANY
WORCESTER 6, MASS.
M-500

6 DIFFERENT FEED RATES ON 1 AUTOMATIC CYCLE... help remove metal faster



Cabinet within easy reach of operator houses electric controls permitting automatic selection of six different feed rates of Monarch Magnamatic. Thus feeds can be adapted to exact requirements, either for faster metal removal or for varying the finish on different portions of the work. Operation is completely automatic throughout the cycle—start of which is controlled by pushbutton on panel within arm-reach of operator.

on Monarch Magnamatic



This feature alone makes the Magnamatic a profitable investment for a wide variety of automatic turning, boring or facing work. Add to it the advantages of exceptionally fast setup (as described at right) and you can see why Magnamatics have been so successful in peace and war production over the past ten years.

For runs as short as 25 pieces, this fully automatic, double carriage, all-electrically controlled machine will show amazing cost reductions. For long runs, the savings are still more substantial. A 10-year record for successful operation proves the time and cost-saving ability of the Magnamatic.

Ask our nearest representatives for complete information and suggestions on how you can utilize the Magnamatic to cut costs on turning, boring or facing work.

THE MONARCH MACHINE TOOL CO. · SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

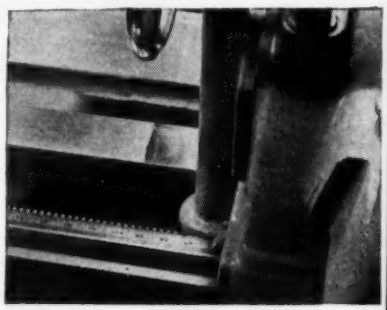
PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

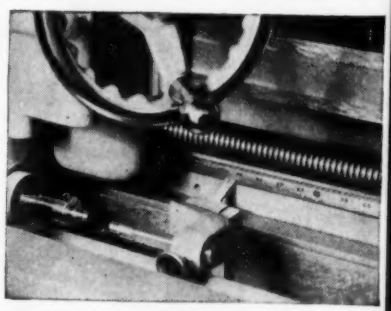
Monarch Saves Time

REMARKABLY QUICK SETUP MAKES SHORT RUNS PROFITABLE

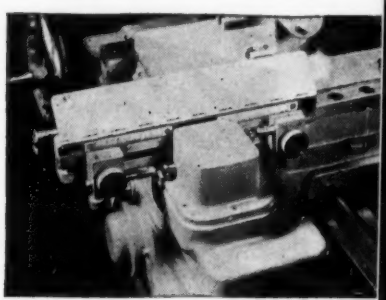
With setup time as low as five minutes in many cases, the Monarch Magnamatic is especially valuable for short runs—profitable even down to 25 pieces. Convenient handwheels and micrometer adjustments provide quick and accurate setup facilities.



Scale and pointer on tailstock for ready positioning of tailstock for various lengths of work. This eliminates necessity of repositioning on setup.



Quick positioning of stops controlling the longitudinal travel of carriage is provided by scale pointer with micrometer finger-tip adjustment.

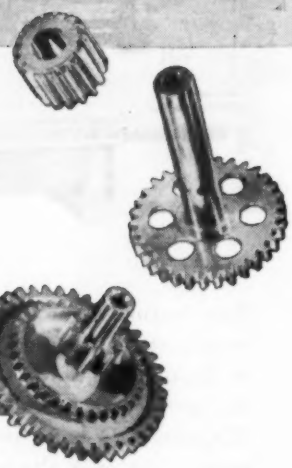


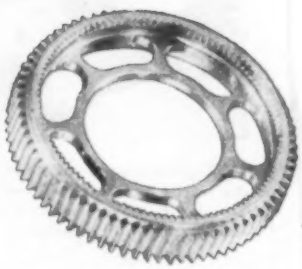
Another quick setup feature of Monarch Magnamatics is the finger-tip control of travel to the slides, provided by this easy-reading and accurate micrometer adjustment.

JET PROPULSION

ANOTHER USE FOR "A-Q" GEARS

AIRCRAFT QUALITY





A copy of this informative product engineering manual on "A-Q" gears will be sent to you on request as soon as it is ready.

ON THE DRAFTING BOARDS of America's aircraft engineers are tomorrow's airplanes—planes that will bring New York City a little more than an hour away from Chicago—London five brief hours from New York. One of the advances that make these high speeds possible is the development of jet propulsion engines.

Still experimental in many phases, jet propulsion engines are today powering fighting ships on the European front. These engines offered many technical problems to designers, not the least of which was the gears. Because of the exacting demands of precision, light weight and high speed, it was natural for builders to look to Foote Bros. for the solution of this tough problem in gear design and production.

The jet propulsion engine is another example of how "A-Q" gears can aid technological development. These gears may well offer a successful solution to production problems you face on machines and equipment which you are manufacturing or planning to manufacture. Foote Bros.' engineers will gladly discuss with you the problem of producing gears to assure you greater mechanical efficiency, lighter weight, higher speed, greater quietness.

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. E, 5225 S. Western Blvd. • Chicago 9, Illinois

FOOTE BROS.

Better Power Transmission Through Better Gears

Oakite Cleaning

Helps Expedite Production of

BOMBS

Oil, Grease, Rust, Scale, Flux NOW Quickly Removed

In the plants of many prime and sub-contractors making demolition, fragmentation, incendiary and other type bombs and their various components, Oakite cleaning materials and methods are providing a dependable answer for the effective, quick removal of oil, grease, flux, scale, smut and rust from surfaces and parts . . . and in expediting production of these important war supplies. Whether used in still tanks or automatic washing machines, fast-working Oakite cleaning materials perform their specific tasks economically . . . help keep production volume up and rejects down.

Oakite Experience and Individual Help Freely Available on Critical War Supplies

Whatever war product you are making, if you have difficulty in obtaining correct SURFACE PREPARATION of work prior to the application of organic, chemical or plated finishes, consult our Technical Service Representative near you. There is no obligation. Our extensive and practical war experience in thousands of plants is yours for the asking. Tell us your problem . . . inquiries promptly answered.

OAKITE PRODUCTS, INC., 26 Thames Street, NEW YORK, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

ASK US ABOUT:

Surface preparation of bombs, fins, before spray painting

Removing oil, rust from noses

Cleaning base plugs

Removing annealing scale between drawing operations

Removing soldering and brazing fluxes

Stripping paint from rejects

Removing shop dirt and grease deposits from steel bands

OAKITE MATERIALS...METHODS...SERVICE

Buy Bonds for Victory

CLEANING FOR EVERY CLEANING REQUIREMENT

HERE'S THE $64

Below: Ex-Cell-O designed and built Precision Way Machines turn out accurate metal parts on a high production basis (a few typical parts are illustrated). These single-purpose machines (in many cases made highly flexible by the new Ex-Cell-O type of bolted-section construction) frequently perform numerous operations in one setting and often bring a substantial increase in the number of parts produced hourly with improved quality and reduced unit cost.

Above: A typical application of an Ex-Cell-O Precision Boring Machine. This particular machine is a three-way type. The center section is designed to hold the part rigidly while the spindles are advanced, the holes being bored in exact relation to each other. The spindles have individual adjustments. The part shown here is a differential carrier steel casting, with two holes finish bored at each end and one from the rear, simultaneously. Each wing of the machine is individually set as to speed and feed with its own hydraulic feed panel. Once the most efficient speed and feed combination is reached, the whole machine is controlled by means of push-buttons, located for the operator's convenience. The machining cycle is automatic after the "start cycle" button is pressed.

EX-CELL-O CORPORATION

Answer

TO *Your* PRODUCTION PROBLEM

See EX-CELL-O *first*

XLO
EX-CELL-O *for* PRECISION

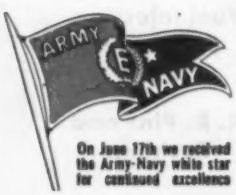
NOW is the time to consult Ex-Cell-O about your future production requirements . . . about the use tomorrow of production machines that will give you definite advantages in speed, accuracy and finish, and that will enable you to get unit cost down to a competitive basis. Your problem may be readily solved by machines designed and built for your specific needs. That is why, when you are designing your postwar product, you should plan at the same time for the best way in production. For many years Ex-Cell-O has been foremost in the designing and construction of special multi-purpose and semi-standard machines for America's leading industries, both large and small. A quarter of a century of precision engineering has gone into this Ex-Cell-O experience. This valuable "know how" is at your disposal. Get in touch today with Ex-Cell-O at Detroit or with one of Ex-Cell-O's field engineers in 32 other industrial centers in the United States and Canada.

- Standard and Special Multiple Way-Type Precision Boring Machines
- Multiple Drilling and Other Special Purpose Machines
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Broach Sharpening Machines
- Continental Cutting Tools
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines
- Aircraft and Miscellaneous Production Parts

Right: **If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.**

DETROIT 6, MICHIGAN

The World's Finest BORING and Milling Machine is made in Detroit



On June 17th we received the Army-Navy white star for continued excellence

This new Model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten-thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

HARDINGE Second Operation Machines mean better results without expensive tooling

For precision second operation work, the trend is to Hardinge. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for these machines.

The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

The illustration shows one of the groups of Hardinge Second Operation Machines in the production of precision aircraft parts at Moore & Steele, Owego, N. Y.

Specifications: 1" collet capacity, 6 " step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

"This business of buying Electrodes used to be pretty tough..."
1. WHEN MY STOCK OF ELECTRODES RAN LOW..
2. I'D STOP IN AT MY DEALER FOR A FRESH SUPPLY.
AWS-E-6012
THAT'S SILVER-FLASH TYPE 329
3. BEING A WELDER I'D ASK FOR RODS ACCORDING TO AWS NUMBERS. BUT THOSE CONFUSING TRADE NAMES PUZZLED ME.
"That's why I like the Allis-Chalmers method of numbering Electrodes"
HERE'S ALLIS-CHALMERS E-6012

USE of standard American Welding Society classification numbers make Allis-Chalmers electrodes *easy to remember* and *easy to buy*. Every rod in the line is made for a definite AWS standard — and each rod is sold according to its official AWS number. There's no confusing trade name, no complicated numbering code. It's the *logical* way to handle electrodes.

Smooth-flowing and with quiet arc characteristics, these electrodes are available in both a-c and d-c types. They're *shop-tested* and *production-proven* in Allis-Chalmers own huge plants. Our nearby welder dealer or A-C district office can supply you. Write for bulletin B6340. A 1779

ALLIS-CHALMERS MILWAUKEE 1, WISCONSIN

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

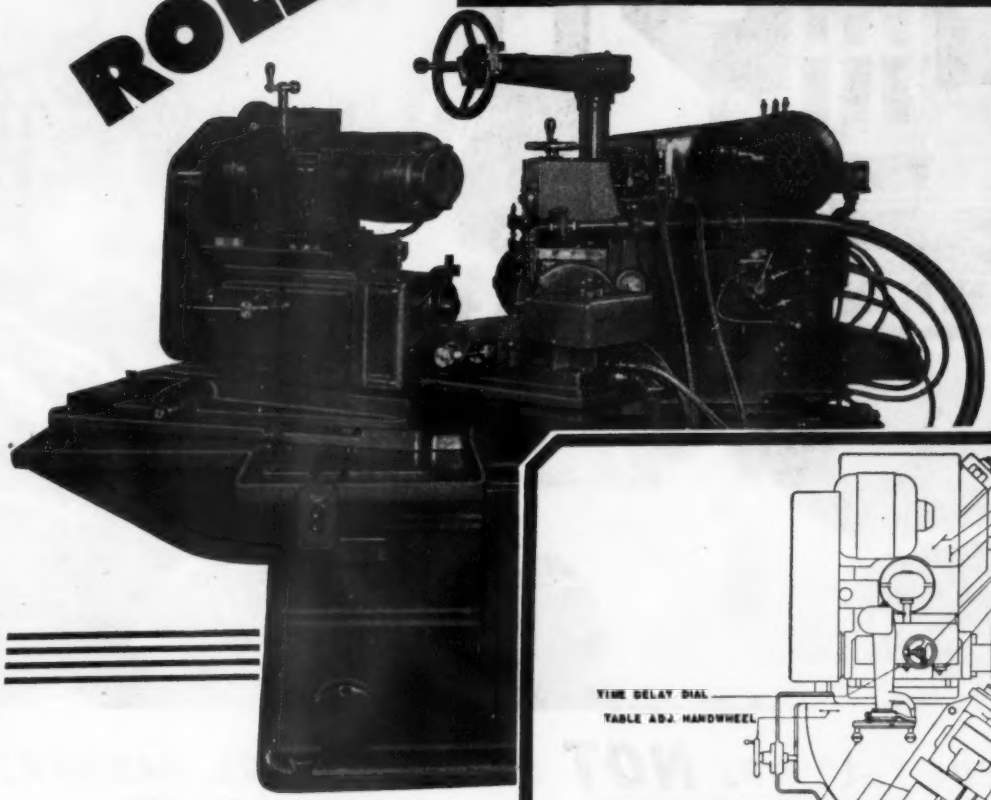
WELD-O-TRON D-C WELDERS

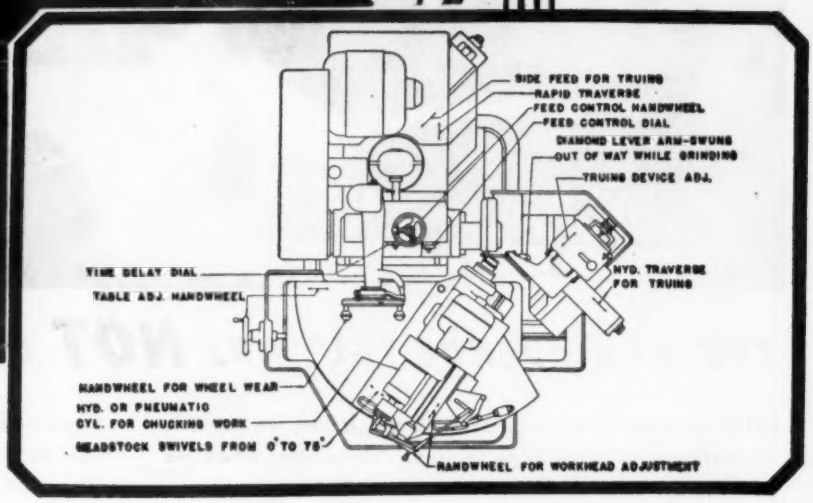
ALLIS-CHALMERS ELECTRODES

ARC WELDING ACCESSORIES

♪ *Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.*

GRIND ROLLER BEARING RACES ON A FITCHBURG




SIDE FEED FOR TRUING
RAPID TRAVERSE
FEED CONTROL HANDWHEEL
FEED CONTROL DIAL
DIAMOND LEVER ARM—SWUNG OUT OF WAY WHILE GRINDING
TRUING DEVICE ADJ.
TIME DELAY DIAL
TABLE ADJ. HANDWHEEL
HYD. TRAVERSE FOR TRUING
HANDWHEEL FOR WHEEL WEAR
HYD. OR PNEUMATIC CYL. FOR CHUCKING WORK
HEADSTOCK SWIVELS FROM 0° TO 75°
HANDWHEEL FOR WORKHEAD ADJUSTMENT

. . . and other Chucking Grinding Operations

THE latest Fitchburg Roller Bearing Race Grinder employs a single standard Fitchburg Bowgage Grinding Wheelhead Unit. The workhead is adjustable from o degrees to 75 degrees so that the machine can be used for many other straight or taper grinding jobs.

The Fitchburg Roller Bearing Race Grinder is completely automatic. By pressing a single button the wheelhead goes through its standard automatic cycle — rapid traverse to the work, proper grinding feed, spark-out time, and rapid return. Work is held to limits of .0002" in production.

The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices.

In this taper grinding application, the wheelhead is mounted on a 45° slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated for trueing, with micrometer adjustment for positioning.

For grinding roller bearing races a Fitchburg grinds them faster and more accurately than other methods. A leading American manufacturer reports enthusiastically on the quality and low production cost of this machine. Write us today for complete information.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of— Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THE 6TH AVENUE "EL" WAS **NOT** SENT TO PEARL HARBOR!

In the January 22nd issue of TIME Magazine, we ran this illustration with a headline reading: "Remember when we sent the 6th Avenue 'El' to Pearl Harbor?"

This was a mistake.

The 6th Avenue "El" was *not* sent to Pearl Harbor — thanks to the straight thinking and vision of Mayor F. H. LaGuardia, Stanley M. Isaacs, Manhattan's Borough President, the support of the other members of the Board of Estimate of the City, and the strict adherence of the Harris Structural Steel Company, contractors for this work. The contracts for the demolition of the "El" stipulated that the scrap iron would not be sold or exported directly or indirectly to any foreign country with the exception of Great Britain. Not one pound of this scrap ever left the United States.

And that was three years before Pearl Harbor — back in the "appeasement" days!

It's too bad there weren't more men thinking straight in those days. Because more than 6 million tons of scrap was sold to the Japs during those three years. And many an American boy was hit by fragments of that American steel — fragments of our own weak thinking in the past.

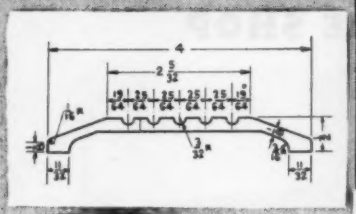
Well, we're strong now. America will come out of this war the most powerful force on earth, and the time to start *thinking* strong is now.

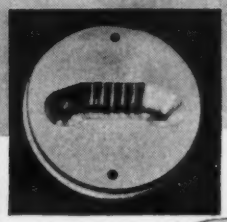
Our greatest immediate contribution to American strength in the future—strength here at home—must be the provision of jobs for our returning fighting men; jobs and security for all!

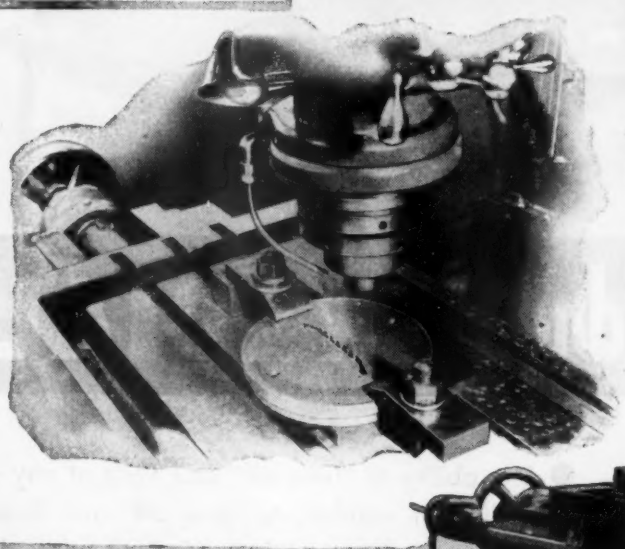
And today, the engineers of the machine tool industry can greatly help the men of government and of industry to provide those jobs . . . to plan now for the reconversion of our tremendous resources in materials and plant equipment to all-out production for a better America! One of these engineers *is* a Bryant man. We urge you to call him now.

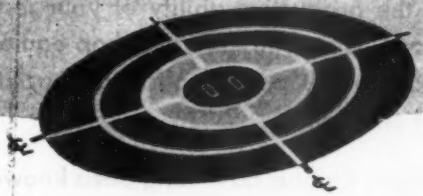
BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

Would You Need More than 10 hours To Mill this Extrusion Die ?









The speed and accuracy with which this extrusion die was milled is unusual — but it's typical performance for a Milwaukee Rotary Head Milling Machine — the most versatile machine ever designed for die and mold work. *Read this job report:*

Material . . High Vanadium — High Speed Steel. **Operation** . . . machine orifice of extrusion die. **Time Distribution** . . . set up, ¼ hour; layout, ¼ hour; rough mill outline, 3/16" deep, 2 hours; rough drill opening through die, 1 hour; finish mill outline, 3/16", 2½ hours; square cut corners with slotting attachment, ¾ hours, mill lead side of die, 3¼ hours. **Total Time** — 10 hours. No templets were required.

Check these advantages of the Milwaukee Rotary Head Mill Machine and how you can benefit from them in your own shop:

DIRECT — mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE—no changes in set-up eliminates chances for error. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST — initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of the intricate molds and dies is the result. Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE

Kearney & Trecker
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation

DOMINATION *of the* **AIR**
demands Precision
IN THE SHOP

FOSDICK Hydraulic RADIALS

● The ability to "take off" and fight at any altitude regardless of weather, to "peal off" and dive at tremendous speeds, to go in against all odds, demands rugged precision built planes.

In your shop — it's the productive ability of your machine tools that counts. The ability of your shop equipment to produce component parts rapidly and accurately regardless of the odds.

The FOSDICK Hydraulic Radials have long been known as such machines. They are easy to operate. Arm and head traverse, and column clamping are hydraulically operated. Traverse rate is variable and is manually controlled making possible rapid accurate positioning of the spindle. Finger tip control permits operator to perform drilling, boring, facing and tapping operations rapidly and with a minimum of cost.

On your next Radial Drill job specify a FOSDICK — for accuracy — speed — and low costs. Bulletin FOSDICK Radial — RA giving complete information is available.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, · · · OHIO

Manufactured by The Heald Machine Co., Worcester, Mass.

There's no such thing for the "Timken Bearing Equipped" Heald 72A Centerless Grinder because it's the ideal piece of equipment to handle medium size work that is ground best by the centerless method. Bores in cylindrical work ranging in outside diameter from 4½" to 9" and up to 6" long are ground easily and accurately. In addition to straight holes, tapers from 0° to 60° included angle can be ground as well, and unsymmetrical parts can be finished if circular shuttles are used.

Precision is paramount because Timken Bearings in the regulating roll and support roll maintain correct and constant alignment and thus help to make possible extremely close concentricity between the ground bore and the O.D. of the machined piece.

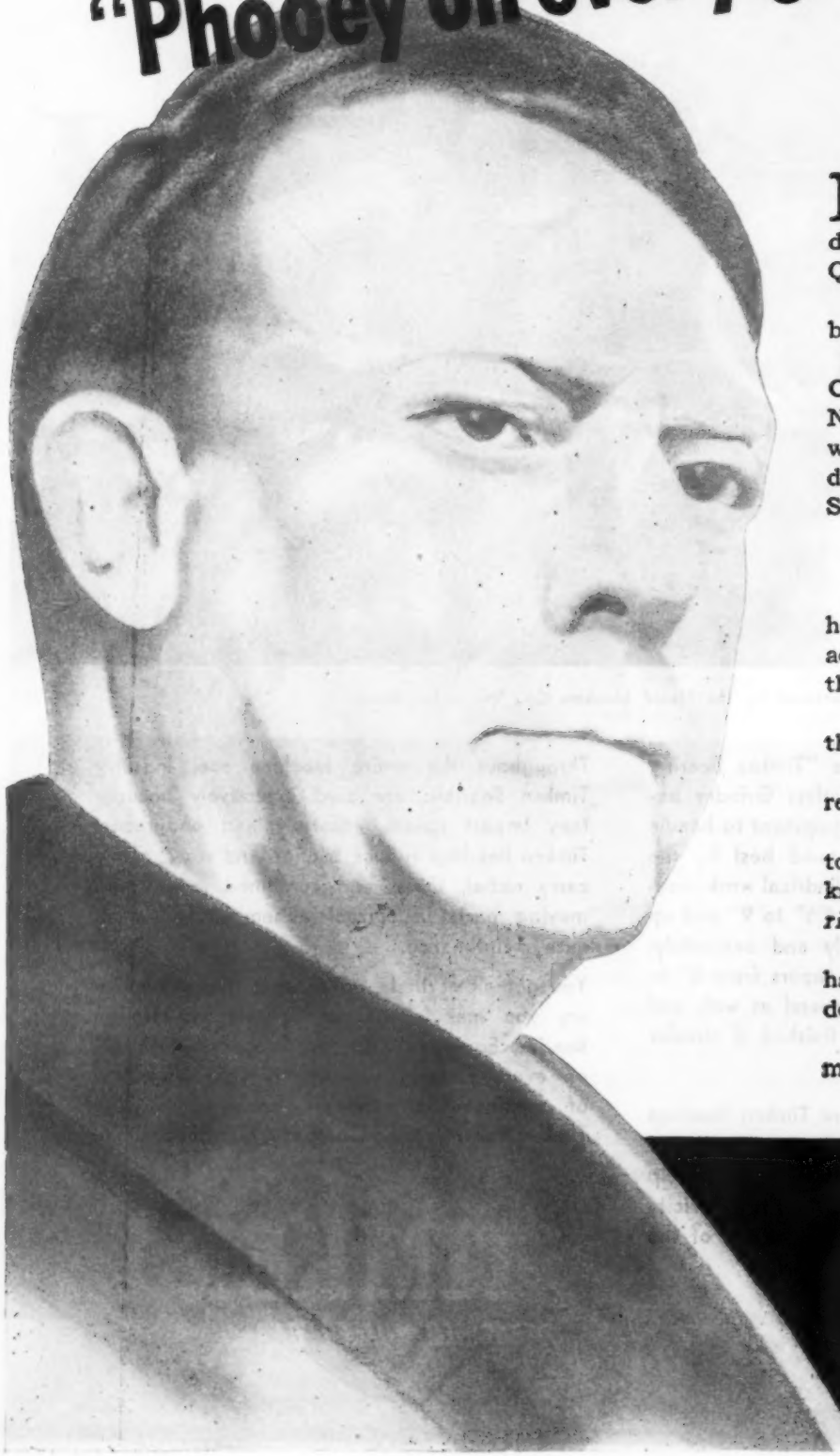
Throughout the entire machine tool industry Timken Bearings are used extensively because they impart speed, accuracy and endurance. Timken Bearings reduce friction and wear, safely carry radial, thrust and combined loads, hold moving parts in correct alignment and minimize maintenance.

You get all of these advantages if the machinery you manufacture or operate is "Timken Bearing Equipped". The trade-mark "TIMKEN" on every bearing you use is your assurance of continuous dependable performance. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

then he said to himself

"Phooey on every good thing"



FEW men are more widely known, and more genuinely detested, than Fuehrer Vidkun Quisling.

. . . and yet few are his orations by which to measure him.

Recently, however, as the Church gained ascendency in Norway, he resorted to a three-word outburst which pictures his double-cross mentality to a T. Says he:

"Religion is outdated."

Well he knows in his stony heart and warped soul that the advance of religion is something that will undo him

. . . so he ridicules it rather than accepts it.

Since when has he ever TRIED religion?

Many men are all too prone to deride that which they do not know *from first-hand expe-rience*

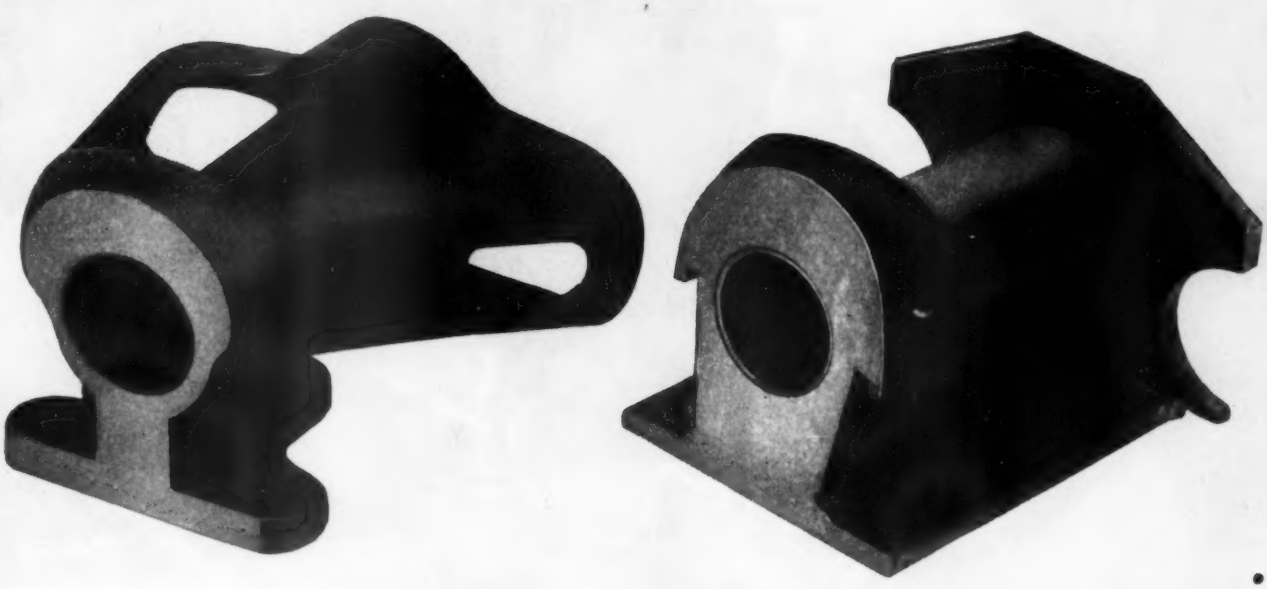
. . . when it is only from first-hand experiences that faith is developed

. . . and that goes for commercial faith as well.

"Outdated!"...*he cries*

LOOK, VIDKUN, OUTDATING occurs only when men take recourse to

WELDED DESIGN . . . A BETTER WAY

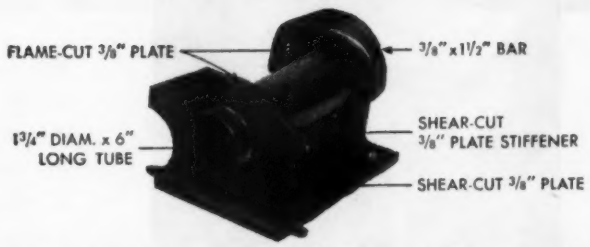


Cost cut from $1.19 to 65¢ by welded design

THIS shaft mounting of a power scythe was changed over to welded design by Jari Products, Inc., Minneapolis, Minn. Production cost of the former conventional design, shown at the left, was $1.19 each. Its weight was 3¼ lbs. Scrap loss was high due to imperfections.

The welded design, completely machined as shown on the right, is produced for only 65¢—about 45% less than the former design. It weighs only 2½ lbs. Use of rolled steel assures uniform strength and precision of every unit produced.

HOW BUILT



Parts tack-welded in positioning jig and finish welded with 5/32" "Fleetweld 7".

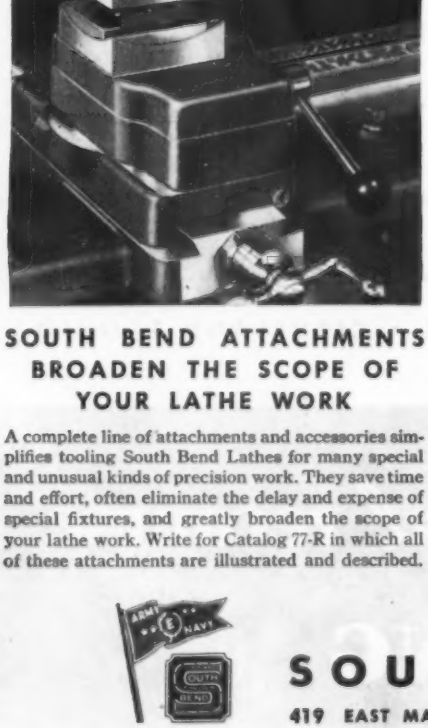
Studies in Machine Design free on request. Write on your letterhead to be placed on mailing list.

THE LINCOLN ELECTRIC COMPANY • DEPT. I-1 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

Versatility---for Every Precision Job



SOUTH BEND ATTACHMENTS BROADEN THE SCOPE OF YOUR LATHE WORK

A complete line of attachments and accessories simplifies tooling South Bend Lathes for many special and unusual kinds of precision work. They save time and effort, often eliminate the delay and expense of special fixtures, and greatly broaden the scope of your lathe work. Write for Catalog 77-R in which all of these attachments are illustrated and described.

The time-saving versatility which enables South Bend Lathes to handle so many exacting precision operations in essential war industries will be a pertinent profit-making factor when normal production is resumed. The ease and speed with which the lathe can be changed from one set-up to another, and the special attachments available to broaden the range of work, save time and reduce labor costs for the plant that has a variety of precision lathe operations to perform.

South Bend Lathes have a wide range of spindle speeds and power feeds. Full quick change gear mechanism permits instant selection of any thread cutting feed, power turning feed, or power facing-feed. Convenient, quick acting controls and easy reading graduations contribute to smooth lathe operation and efficiency.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swings. Precision Turret Lathes are available in two sizes: ½″ and 1″ collet capacity. Write for new Catalog 100-D giving full descriptions of all lathes.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA • *LATHE BUILDERS FOR 38 YEARS*

MACHINE COMPANY
many
THINGS AHEAD

It is reported that . . . . . .

Ball bearings, for precision equipment, are now made with outside diameter as small as two millimeters. *Science News Letter.*

get ready with CONE for tomorrow

The first cotton crop to be harvested entirely by machine has recently been reported. The result seems to be a lower grade of cotton offset by reduced cost. *Time.*

get ready with CONE for tomorrow

Postwar automobile wheel rims are to be wider, or about three-fourths of the tire width. *National Wheel Rim Assn.*

get ready with CONE for tomorrow

The combined use of the electron microscope and the three-dimensional vectograph is making possible better observation of the structure of metals and consequent improvement of alloys. *Dow Chemical Company.*

get ready with CONE for tomorrow

A new product is intended to seal the spaces between spot welds and make a continuous liquid-tight joint. *Presstite Engineering Co., St. Louis.*

get ready with CONE for tomorrow

A new system of aircraft engine lubrication is claimed to supply an adequate flow of oil as high as 45,000 feet. *Penn. State College and Sharples Co., Phila.*

get ready with CONE for tomorrow

The number of persons employed in individual research laboratories just about doubled in the ten years ending in 1940. *G. Edward Pendray, Asst. to President, Westinghouse Electric & Mfg. Co.*

get ready with CONE for tomorrow

A new process of adding carbon black to liquid rubber latex will, it is hoped, reduce the cost of tires and add to their service. *General Tire & Rubber Company.*

get ready with CONE for tomorrow

It is claimed that one of the new rechargeable flashlight batteries will outlast 400 of the usual dry cell type. *B. F. Goodrich Co.*

A new 4 by 6 foot "tectonic" map of the United States shows the complete geologic structure of the country and is said to be the first of its kind ever published. *American Assn. of Petroleum Geologists.*

get ready with CONE for tomorrow

A new device called the "Odograph" automatically makes a map, in any scale, of a road while being carried in a fast-moving automobile. *U. S. Army Engineer Corps.*

get ready with CONE for tomorrow

A jet propulsion drive for torpedoes has recently been patented. *Science News Letter.*

get ready with CONE for tomorrow

A portable electrostatic air cleaner is used to precipitate the smoke produced by welding. *Westinghouse Electric & Mfg. Co.*

A manual of instruction in the making of aerial "highway signs" for the guidance of aircraft has just been published. *Civil Aeronautics Administration.*

get ready with CONE for tomorrow

The Combined British Astronautical Societies have designed a "space ship" in which they propose to send three men to the moon in about 48 hours. *Electronic Markets.*

get ready with CONE for tomorrow

An automobile manufacturer is already planning the assembly-line production of helicopters. *Nash-Kelvinator Corp.*

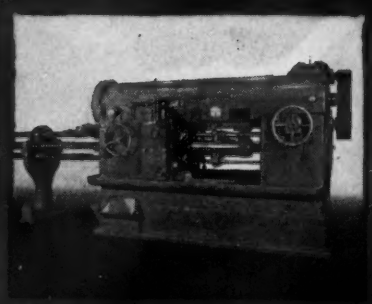
get ready with CONE for tomorrow

A new material for shoe soles is said by the maker to be lighter and more durable than leather and resistant to oil and water. *B. F. Goodrich Co.*

get ready with CONE for tomorrow

More than 80,000 farmers obtained government priorities to electrify their farms, in 1943, as a means of increasing food production. The 1944 total will probably reach 120-, 000. *EMPIC No. 8.*

This machine cuts its own weight in metal in four days



To produce the part shown, 8 pounds of chips — over a sixth of a ton of metal per hour — were removed from W.D1314 bar stock.

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

When you modernize...

USE A GEARMOTOR

W.P.B. indicates that we'll all be pushing war production for many months. And then the heat goes on reconversion.

Much of your equipment, running at peak load since 1941, probably needs to be replaced or modernized. Whichever you need . . . replacement or modernization . . . use a gearmotor when the drive requires speed reduction. Here's why.

A gearmotor is the most efficient means of speed reduction available today. It's more compact . . . lasts longer with less maintenance . . . is easier to install . . lower in over-all cost . . . and safer for your employees. These advantages are not idle claims . . . for they've been proved in actual industrial installations.

Westinghouse offers a complete line of gearmotors for any speed reduction application from 1 to 75 hp. Each unit is specifically designed to conform to industry-wide A.G.M.A. standards. Each new unit contains many improved exclusive design features. Call your nearest Westinghouse office for details. Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-07227

Westinghouse Gearmotors

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Four out of five drives need speed reduction

"Cincinnati Boring Mills and Planers are the Backbone of our Output."

America's largest manufacturers of gun mounts told us in an unsolicited compliment to Hyproduction machines in his large midwestern plant.

He went on to say, "We all appreciate your complete cooperation in our struggle to equip this plant."

Now you can enjoy even faster cooperation than we were able to give this gun mount manufacturer.

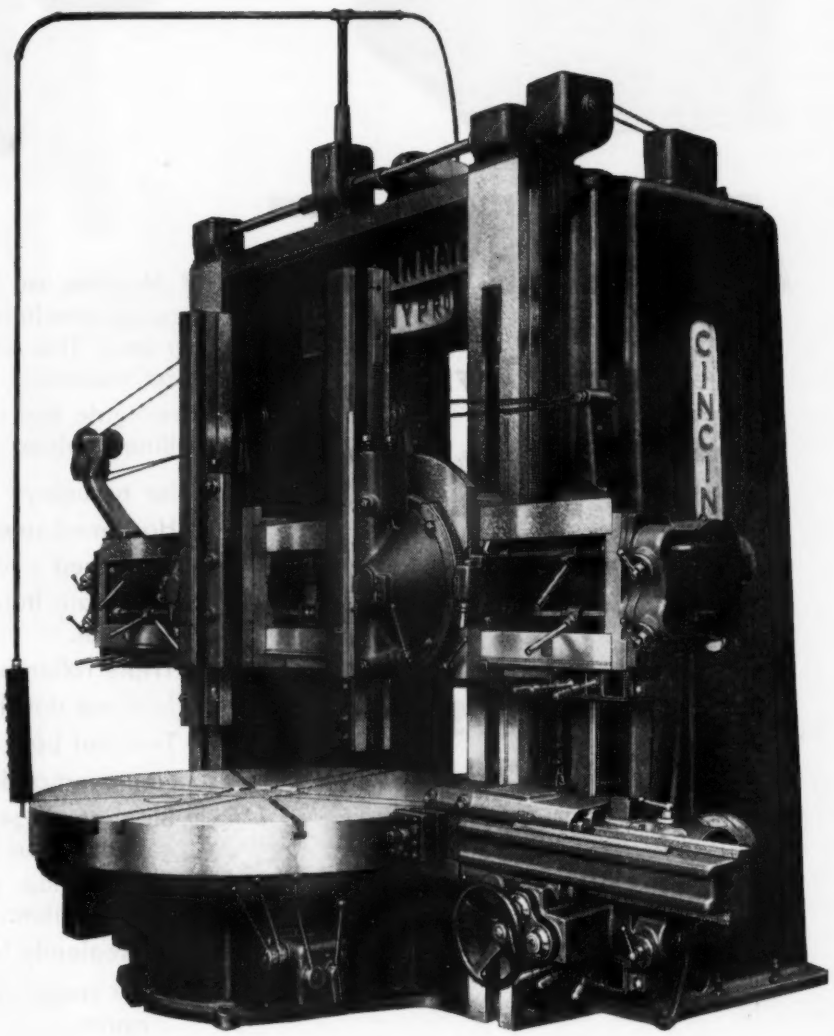
We can now offer 7' Cincinnati Hypro Vertical Boring Mills on very attractive deliveries.

CINCINNATI HYPRO VERTICAL BORING MILLS

have all the latest, unexcelled Hypro features. All Cincinnati Hypro Machine Tools are designed for

- **RIGIDITY**
- **ACCURACY**
- **SPEED**
- **LOW COST**

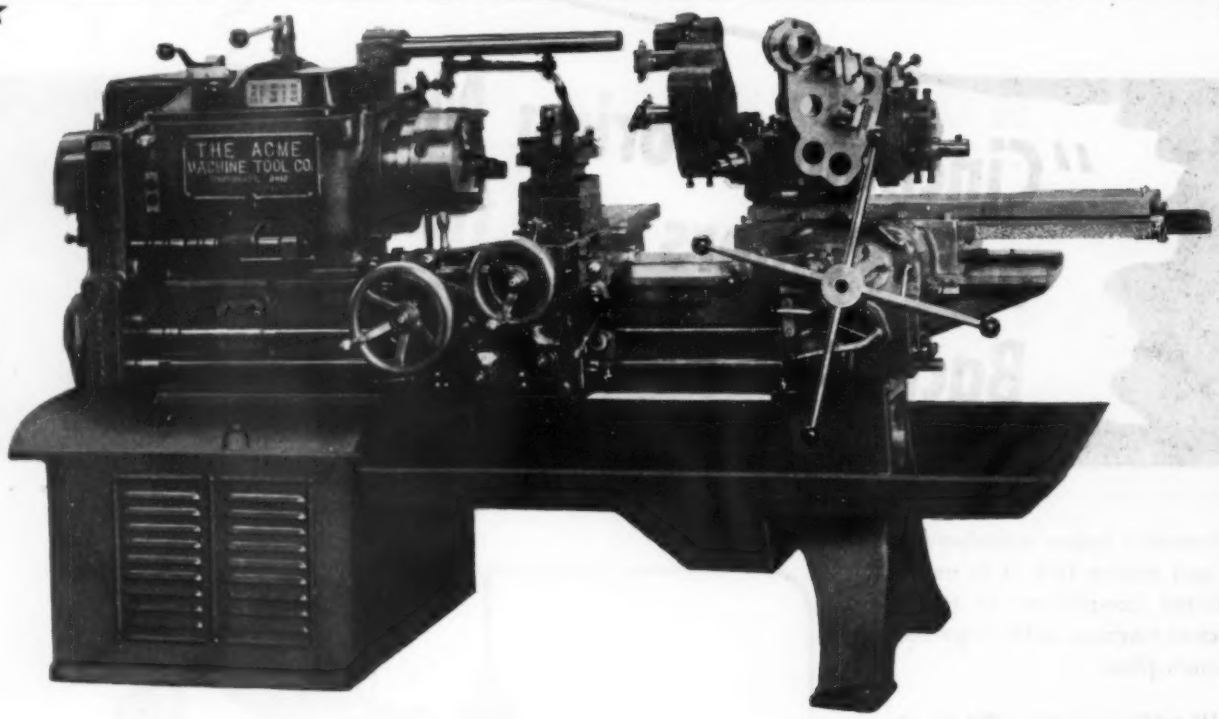
Write for Catalog 132 describing these mills.



THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.



ACME

Ram Type TURRET LATHE for Chucking Work

● Machine as illustrated shows the standard chasing attachment to cut from 4 to 32 threads per inch. This attachment is furnished as extra upon request.

Investigate the many features of this machine outlined below.

for accuracy—for speed—for low cost . . .

Hardened steel vees on bed.

Hardened steel ram slide bearings.

Automatic indexing and clamping of hexagon turret.

Triple roller bearing spindle.

Inverted dovetailed cross slide.

Twin nut back lash eliminator on cross screw.

Non-overhanding headstock.

Side carriage apron taper gibed to front bearing on bed.

Combination pump and splash headstock lubrication.

Conveniently located operating levers.

Wide range of independent feeds for either apron.

The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.

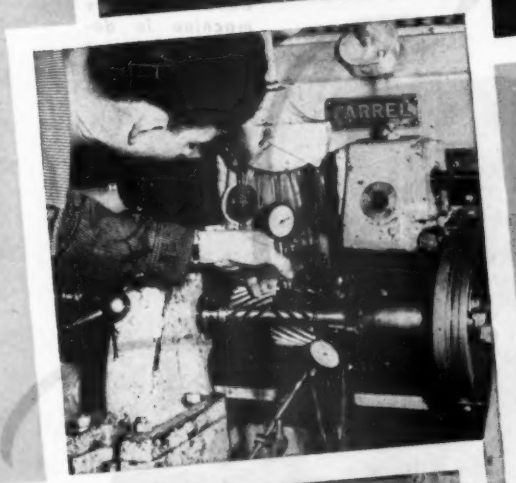
There's an improvement

in production, tool life, and finish

when the proper Gulf Cutting Oil is used!

Aircraft Supercharger Impellers

Gulf Cut-Aid proved superior to twelve other brands of cutting oil tested in this plant for straddle milling aluminum alloy supercharger impellers. With this revolutionary new cutting oil, production is 10% greater and tool life 50% longer than with cutting oil previously used.



Helical Gears

The use of Gulf Cutting Oils on this gear generator led to a 20% increase in cutting speed, 25% greater tool life, and improved production.

Shell Adapter Rings

When the proper Gulf Cutting Oil was put in service on this big automatic, rejects were reduced to a negligible percentage, tool life was greatly increased, and bearing trouble was eliminated.

AGAIN AND AGAIN, on the most exacting war assignments, Gulf Cutting Oils have made outstanding improvements in production and tool life. Call in a Gulf Service Engineer today and let him show you how they can help you with *your* machining problems. Write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION · GULF REFINING COMPANY

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
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GULF INDUSTRIAL LUBRICATION

For jobs requiring extraordinary

POWER & RIGIDITY

GRAY SWITCH PLANER

● Gray Switch Planers are designed to handle those jobs requiring exceptional power and rigidity.

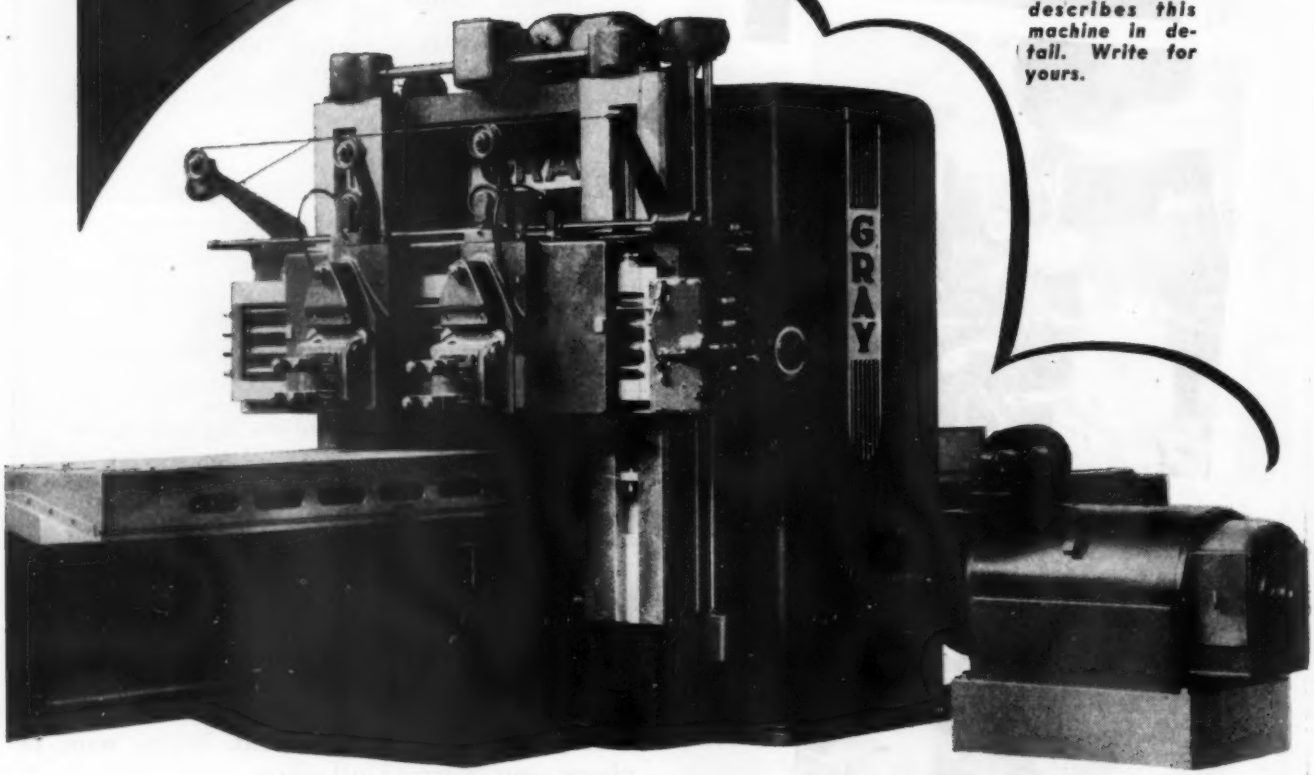
They have necessary power to drive cutting tools to their limit and rigidity to use that power most effectively.

The beauty of this planer is that its parts are of sufficient weight to give rigidity and so accurately made that there are no loose fits to cause vibration.

And most important they are easy on the operator insuring maximum production. The operator, from his normal operating position can feed either manually or by power—can rapid-traverse either one or both of the two massive heads without effort.

BULLETIN No. 49

illustrates and describes this machine in detail. Write for yours.



GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

NEW!

and definitely BETTER

STANDARD *Decimatic*

DIAL INDICATOR

★ *BETTER because:*

Newest addition to STANDARD line, purposely designed to give you these gaging advantages:

★ Perfect repeatability, whether workpiece is applied slowly or abruptly.

★ Hand registers instantaneously, without whip or waver. Red hand lessens fatigue; speeds inspection.

★ Decimal dial graduations, as on blue print, eliminate errors in reading.

★ Reduced spindle tension, in some models up to 50%, and reduced internal friction give greater sensitivity.

★ Range less than one revolution. Avoids errors on parts more than a revolution oversize. (Range may be increased by removing stop collar).

★ Patented "Shockproof" design protects mechanism and is key to the *superior* accuracy of this Indicator.

★ Upper half of face free of excess markings to facilitate easy reading.

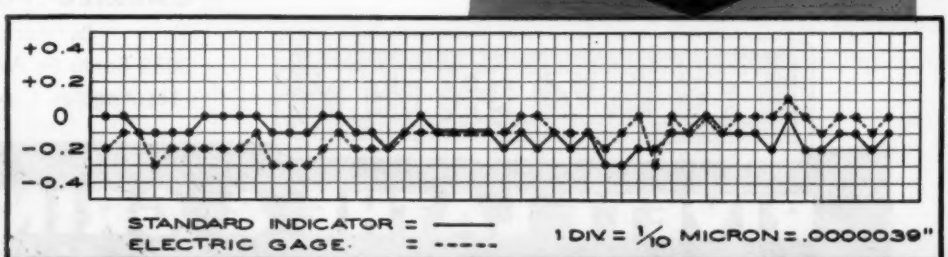
★ All mounting dimensions AGD standards.

Ask for Special Decimatic Bulletin

Catches Rejections Red-Handed

Graph of impartial test by prominent gage user. STANDARD *Decimatic* repeatability checked against elaborate electric gage costing more than ten times as much. Note greatest difference in readings does not exceed 2/10 micron.

A Convincing Comparison of Precision



STANDARD GAGE CO., Inc., *Poughkeepsie, N.Y.*

COLLETS *with Character*

A RIVETT DRAW-IN COLLET has personality derived from a worthy inheritance and a steadily improved environment. Today when a RIVETT COLLET is shipped in its distinctive carton it reflects fifty years of experience and the most advanced methods in manufacture and inspection.

RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

CARRIED FOR STOCK DELIVERY

By Machinery Sales Company

3838 Santa Fe Ave.
Los Angeles, Calif.

1274 Folsom St.
San Francisco, Calif.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

Make
P & J RE-TOOLING
part of your conversion program

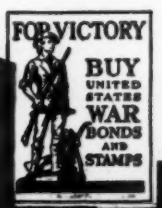
The tooling on the job shown here, specially designed to handle the work on a P & J 6 DRELX Automatic Chucking and Turning Machine, has met wartime needs for both speed and economy. Converted by P & J re-tooling for post-war requirements, it offers the means for cost-cutting which will be demanded by a highly competitive market.

...and meet the challenge of low-cost production

As peace time manufacture is resumed, the necessity for turning from production at any cost to production at lowest cost becomes a major problem. However, it is not a difficult one to solve for users of P & J equipment, because changeover to handle new work is comparatively simple. Furthermore P & J Automatics are low-cost producers on any work because tooling set-ups are available which result in maximum time and money savings.

Consult P & J engineers on your re-conversion problems. Let them offer recommendations for re-tooling your P & J equipment.

THE POTTER & JOHNSTON MACHINE CO.
Pawtucket, R. I.

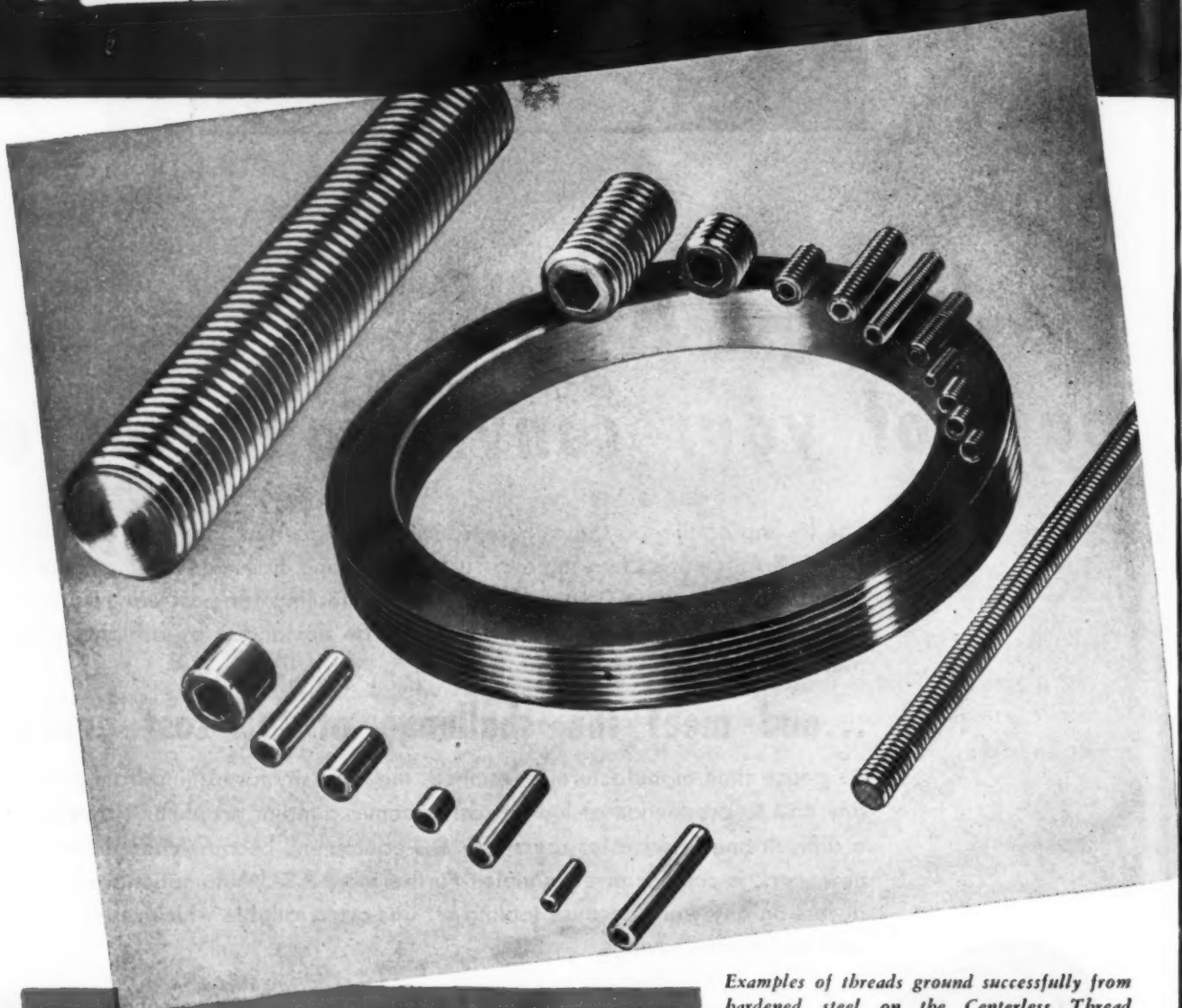


BOND BUYING HELPS US AND HURTS OUR ENEMIES

New!

UP TO 500% GREATER PRODUCTION

Centerless Ground Threads



Examples of threads ground successfully from hardened steel on the Centerless Thread Grinder. 12" long ¼" dia. screws of 20 pitch ground in a single pass; 5" dia. rings with 16 pitch threads; socket screws from ⅛" dia. 40 pitch to ⅝" dia. 11 pitch ground in a single pass.

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

The first practical answer to large volume, low cost production of ground screw threads is provided by the new LANDIS TOOL Centerless Thread Grinder. It was developed by LANDIS TOOL to meet wartime demands for more and still more production of threaded parts to the closest tolerances. The Centerless Thread Grinder, by a year of actual operating experience since emerging from the LANDIS TOOL laboratory, has demonstrated its worth for today's production needs.

The centerless method of thread grinding employs a formed multiple groove grinding wheel. Work feeds thru continuously. The reduction in work handling operations makes possible unbelievably large production increases. Actual tests on specific parts showed increases in production per day of from *two to five hundred per cent.*

Clean, bright threads are produced on the new LANDIS TOOL Centerless Thread Grinder with the characteristic smoothness of a ground finish. Because the blanks are hardened *before grinding,* less inspection is required and rejects approach the vanishing point because a true thread form is produced by the accurately formed multi-groove wheel. Accuracy of shape and form of the finished thread is maintained free from warpage and distortion errors ordinarily caused by heat treatment.

If you have a thread grinding problem, our engineering department will be glad to investigate the possible application of the Centerless Thread Grinder. Give us full details and we shall be glad to make a recommendation.

Landis Tool Centerless Thread Grinder complete with built-in wheel crusher. Convenient controls permit adjustments for different sizes of work, rates of feed and position with respect to wheel.

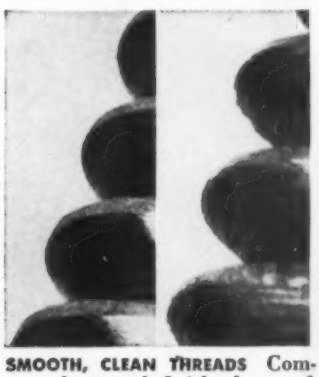
READY NOW TO SPEED WAR PRODUCTION!

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

PARKER-KALON *Presents* Ground Threa

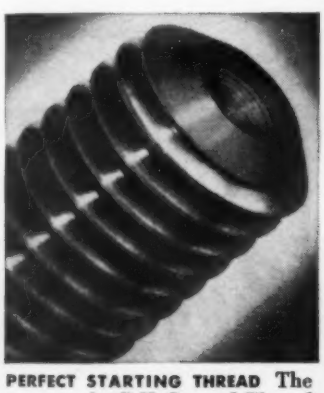
Unretouched photograph of Ground Threads



SMOOTH, CLEAN THREADS Compare the superb finish of ground threads (left), with the tool-marred surfaces of cut threads (right). Ground threads reduce friction, speed assembly.

GUARANTEED CLASS 3 FIT Thread grinding by the new method makes sure of remarkable uniformity, assures fastenings of dependable security.

PERFECT THREAD CONTOUR AND LEAD The smooth surfaces and the accuracy of ground threads is immediately apparent in the comparator.

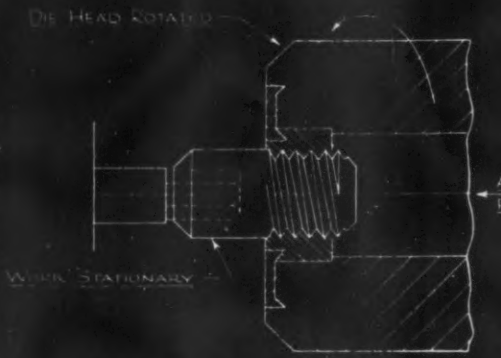


PERFECT STARTING THREAD The reason why P-K Ground Thread Set Screws start easier, and speed assemblies, may be easily seen in this closeup.

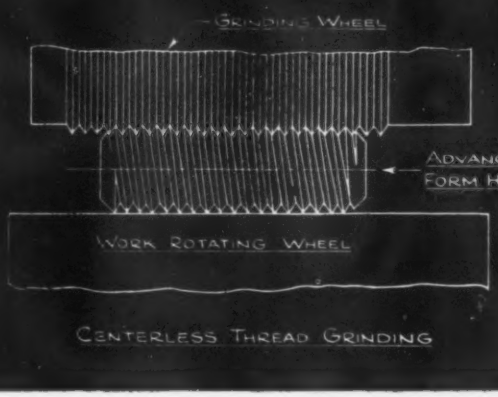
A Joint Achievement of LANDIS TOOL COMPANY and PARKER-KALON CORP.

The threads of the new Ground Thread Socket Set Screws are generated by the revolutionary new Landis Tool method of centerless thread grinding. These diagrams show the difference between the conventional method of cutting threads and the new Landis Tool method of centerless thread grinding.

PARKER-KALON is happy to have had the opportunity to co-operate with the Landis Tool Company in the application of this revolutionary new Landis Tool method to the production of screws, and to be the first to present this process of set screw manufacture.



CONVENTIONAL THREAD CUTTING



CENTERLESS THREAD GRINDING

A revolutionary new process brings you socket set screws years ahead in quality . . . at no higher price!

ET SCREWS of GAUGE-LIKE ACCURACY

UP TO NOW, thread grinding has been a process employed only for finishing screws used in the finest precision equipment. It remained for Parker-Kalon – cooperating with the Landis Tool Company – to adapt thread grinding to quantity production of socket set screws . . . the most important development since the advent of this type of screw.

P-K GROUND THREAD SET SCREWS are *years ahead* in appearance, precision, and performance. The smooth, clean, gleaming finish has none of the nicks, burrs, or tool marks common to ordinary set screws. By every dimension test, they excel any previous standard for accuracy.

ASSEMBLIES ARE MADE FASTER with these superior screws, because they are held to standards of accuracy heretofore unattainable on a production basis.

FREE SAMPLES will be sent at your request. Write now. Examine these finer Set Screws . . . you'll find it hard to believe *they cost no more!* Parker-Kalon Corporation, 194-196 Varick Street, New York 14, N. Y.

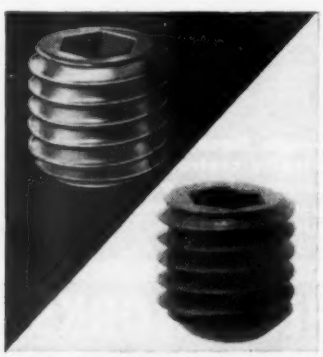
WHEN YOU CAN OBTAIN THESE NEW GROUND THREAD SET SCREWS . . .

Present facilities are too limited to permit the building of adequate stocks. Therefore, orders cannot be filled at this time. As soon as additional equipment is put into production we will be in a position to take care of demands through our distributors. Meanwhile, free samples are available.

★ ★ ★

A PRODUCT OF PARKER-KALON SPECIALISTS IN FASTENING DEVICES

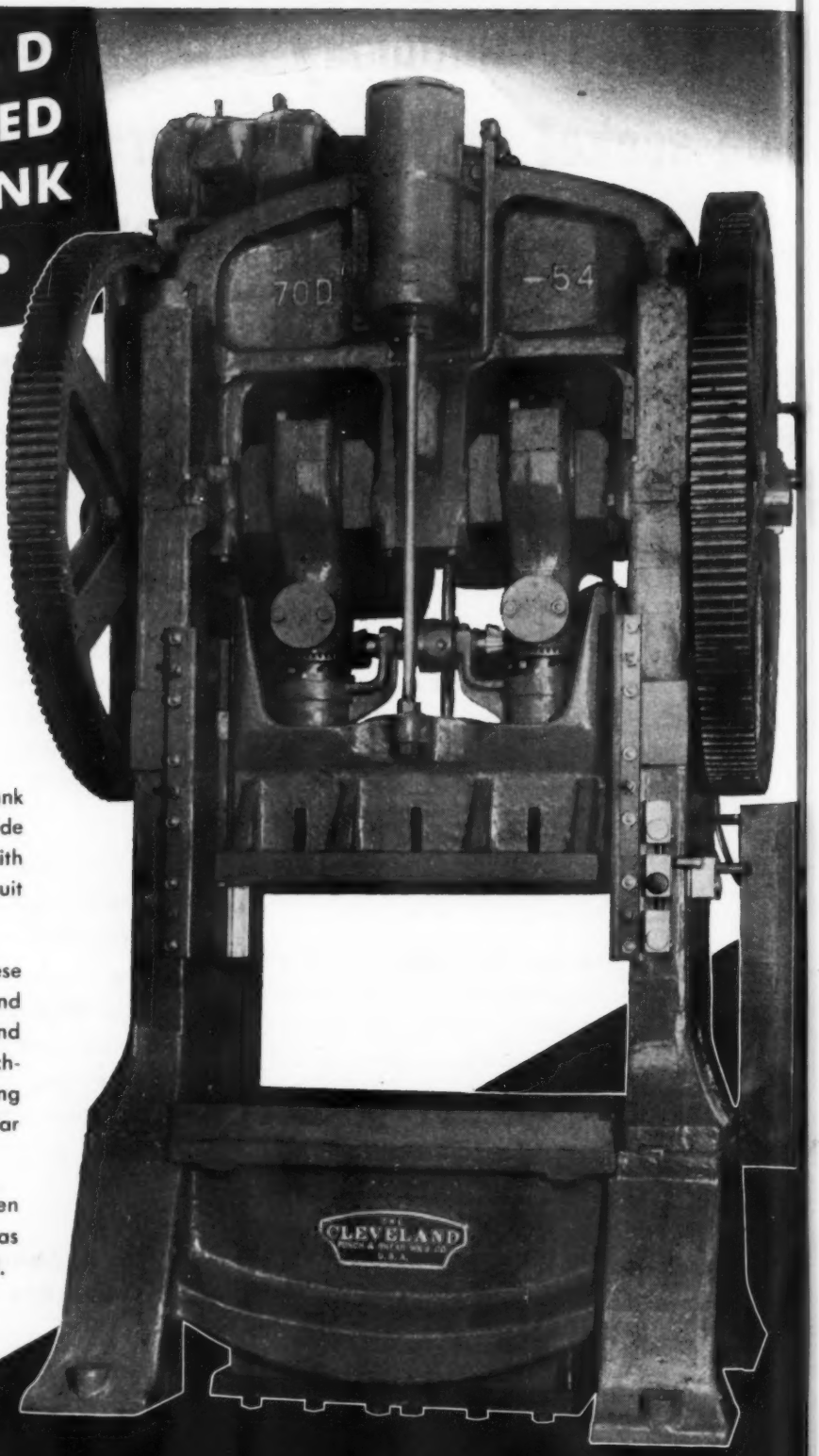
CKS, NO BURRS, NO HARDEN-RACKS Threads are ground *ardened blank,* increasing d strength, and preventing mperfections common to reads.



DIFFERENT AS NIGHT AND DAY The years-ahead quality of the P-K Ground Thread Set Screw is apparent at a glance . . . proves out in performance.

PARKER-KALON
Ground Thread
SOCKET
SET SCREWS

CLEVELAND STRAIGHT-SIDED DOUBLE CRANK PRESS • •



Cleveland Straight Sided Double Crank Presses can be furnished in a very wide range of sizes and capacities and with stroke, adjustment, die space, etc. to suit particular requirements.

The more general application of these Presses is in the manufacture of light and heavy sheet iron and steel products and they can be used advantageously for punching, forming, stamping, bending, cutting and light embossing of large and irregular shapes.

On very wide or long stroke Presses, or when the work is particularly heavy, twin drive, as shown in the illustration, is recommended.

• • 70-D-54—Straight Sided Double Crank Press equipped with electrically controlled air friction clutch—twin drive, air counterbalance, air cushion in bed. The Press has a stroke of 10", adjustment 4", bed area 40" x 54" and a capacity of 180 tons.

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY

Cleveland 14, Ohio

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

Specify

WIRE TYPE PLUG GAGES

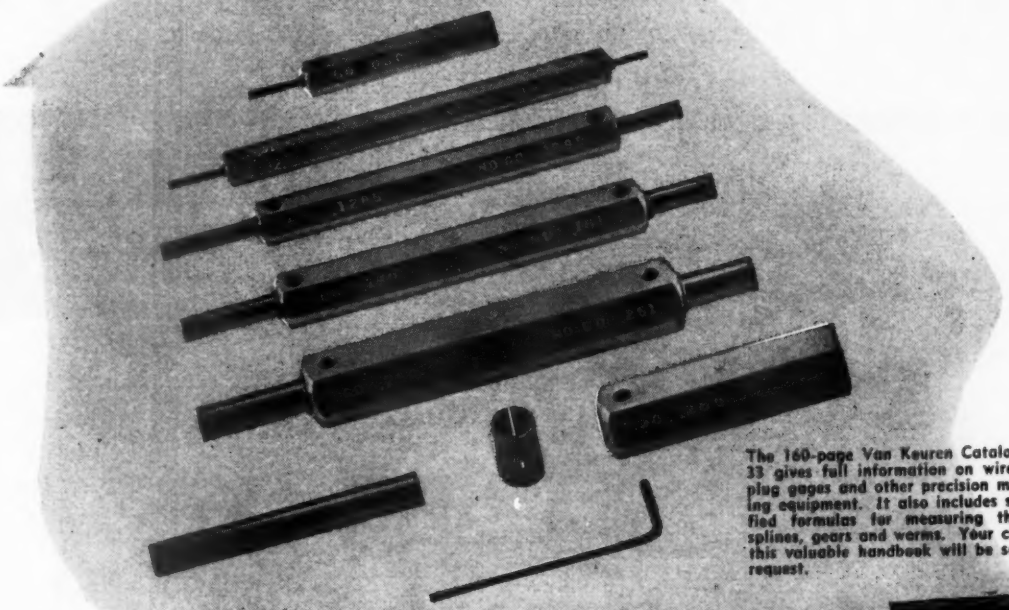
. . . for gaging small holes

Wire type plug gages were originated by The Van Keuren Co. in 1925. They are now in almost universal use for gaging small holes.

Longer lasting precision and lower gage cost is assured because the entire 2" length of the gaging unit can be used. When the end becomes worn, it is ground off and a new section of the original accuracy is moved out for use. The wire unit is securely held in the handle by a split bushing and a headless set screw.

Van Keuren wire type gages are made to Class B accuracy, $+.00005''$ $-.00000''$ on the Go units and $\pm.000025''$ on the No Go units. Closer or wider tolerances can be supplied if desired.

Hard chromium-plated gaging units for use where the requirements are severe can be furnished at a slight additional cost.



The 160-page Van Keuren Catalog No. 33 gives full information on wire type plug gages and other precision measuring equipment. It also includes simplified formulas for measuring threads, splines, gears and worms. Your copy of this valuable handbook will be sent on request.

Wire Type Plug Gage Set No. 60. This set of gages provides accurate standards for checking twist drills in sizes from 1 to 60 (.228" to .040" diameter). A useful set of standard size gages. Price—$375.00.

Van Keuren Wire Type Plug Gage Set No. 80 which includes drill sizes from No. 1 to 80 (.228" to .0135"), price $425.00.

Van Keuren

25th YEAR

THE VAN KEUREN CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment—Light Wave Micrometers—Gage Blocks—Taper Insert Plug Gages—Wire Type Plug Gages—Measuring Wires—Thread Measuring Wires—Gage Micrometers—Thread Gages

Eight-Way DRILLING and TAPPING MACHINE *by Snyder*

This large special-purpose machine, designed and built by Snyder, demonstrates the practicality of combining multiple drilling and multiple tapping in a production operation.

The part is clamped in a locating fixture mounted on a 180° index table which, in turn, is mounted upon a ball bearing fixture carriage.

The carriage carries the part, first, to the left end of the machine for the drilling operation, then (after indexing 180°) to the right for the tapping operation.

The multiple drilling heads and bushing plates are mounted on Snyder self-contained hydraulic guide bar units.

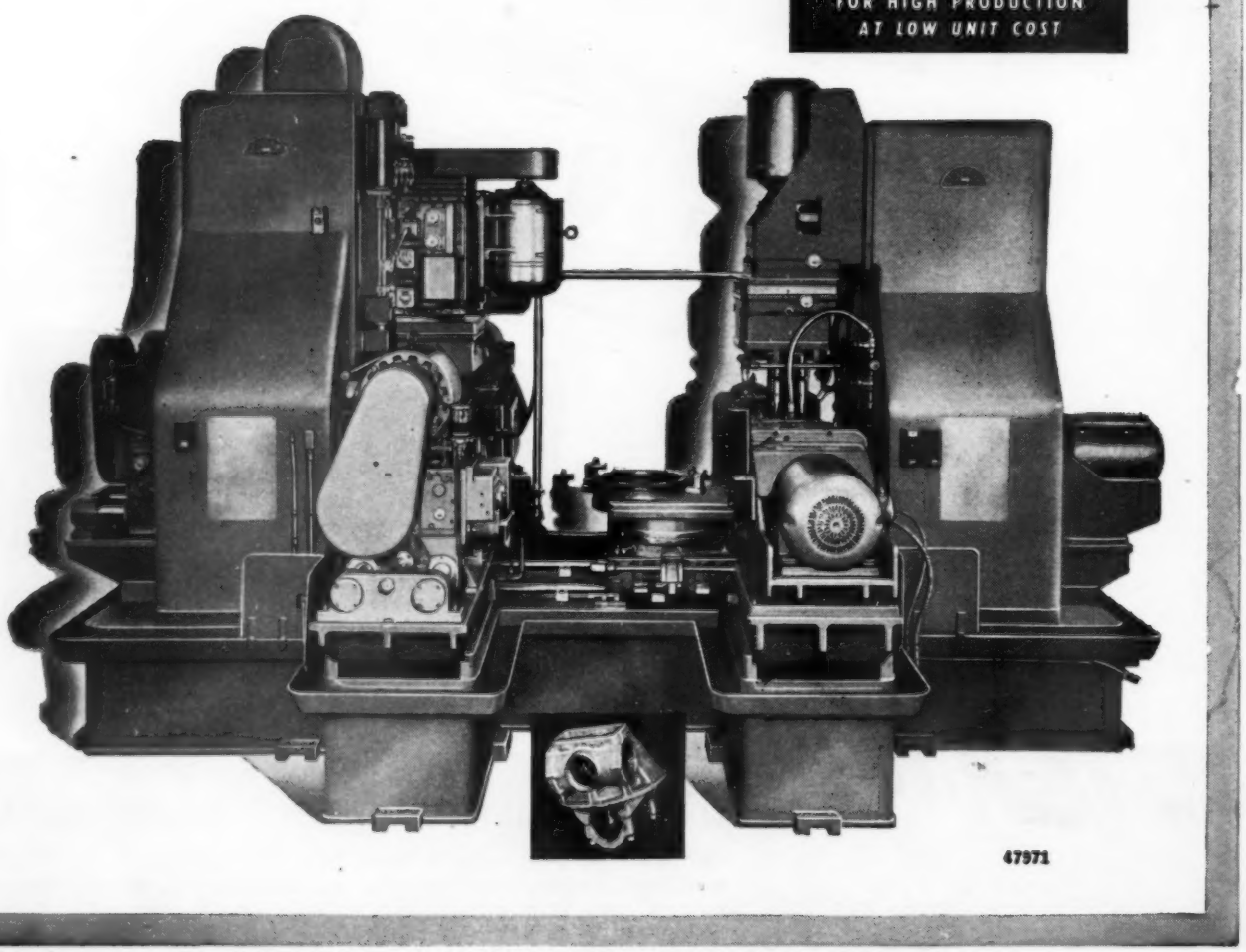
Tapping units are equipped with fixed center tapping heads. Each spindle has individual screw feed and is equipped with ball bearing safety spindle end to protect work piece and tools, providing automatic retraction of any individual tool which encounters any obstacle. All heads interchangeable for a wide variety of other parts.

With the safeguards and controls which Snyder has provided, this type of machine is adaptable to a considerable range of parts and may be retooled again and again, at relatively little cost, since only the equipment is changed.

If your postwar plans call for the efficiency and economy of special-purpose production machines, we invite your inquiry—*Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

20 Years of Successful Co-operation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST



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GAGES – CARBIDE TIPPED TOOLS

Metro Standard Tools and Gages are doing a grand job in all types of production—because they're made by men who know how to make tools for men who know how to use them.

Maybe a *special* tool or gage would save you money on your operations. Ask us to design or make it up for you.

Standard Gages and Carbide Tipped Tools are available through your Metro distributor.

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TOOL AND GAGE CO.

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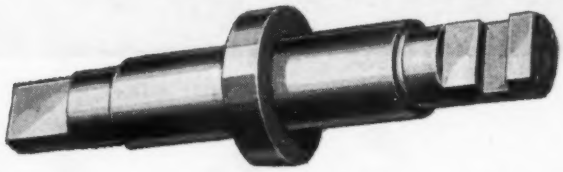
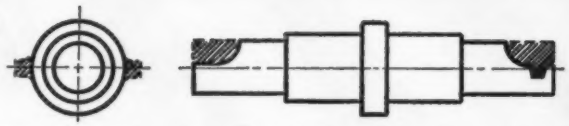
FOUR finishing operations with ONE machine



Problem:

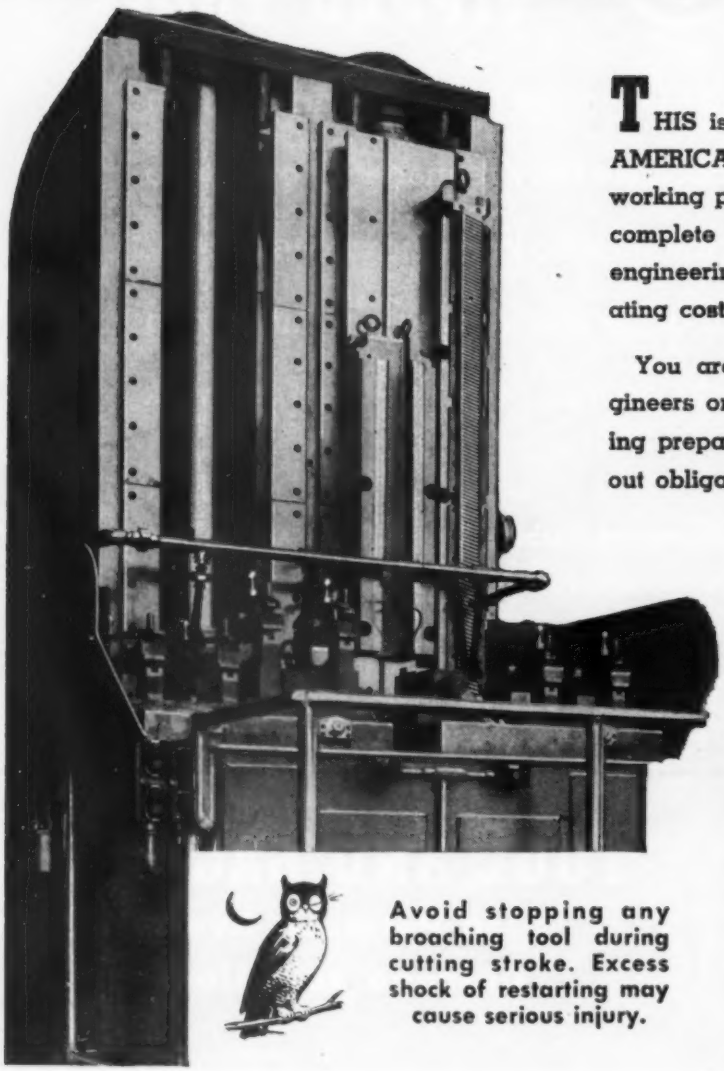
1. Remove driving lugs on large diameter of bulldozer track roller shaft.
2. Broach flat in right end of shaft.
3. Cut notch in right end flat.
4. Broach flat in left end of shaft.



ABOVE DRAWING OF PART SHOWS FOUR OPERATIONS PERFORMED IN A SINGLE CYCLE OF THE AMERICAN SBD 72-30 BROACHING MACHINE. SHADED PORTIONS INDICATE MATERIAL REMOVED.

Solution:

American SBD 72-30 Surface Broaching Machine turns out a *complete part in every cycle.*



THIS is just one example of how broaching, the AMERICAN way, can solve many of industry's metal working problems. In countless fields, AMERICAN'S complete broaching service—machines, tools, and engineering—has stepped up output, reduced operating cost.

You are invited to consult with AMERICAN engineers on your own war and postwar manufacturing preparations. Their services are available without obligation.

Avoid stopping any broaching tool during cutting stroke. Excess shock of restarting may cause serious injury.

MEMBER BROACHING TOOL INSTITUTE

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BROACH AND MACHINE CO.

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SPECIAL MACHINERY

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DIES AND HOLDERS
Available in a wide range of sizes!
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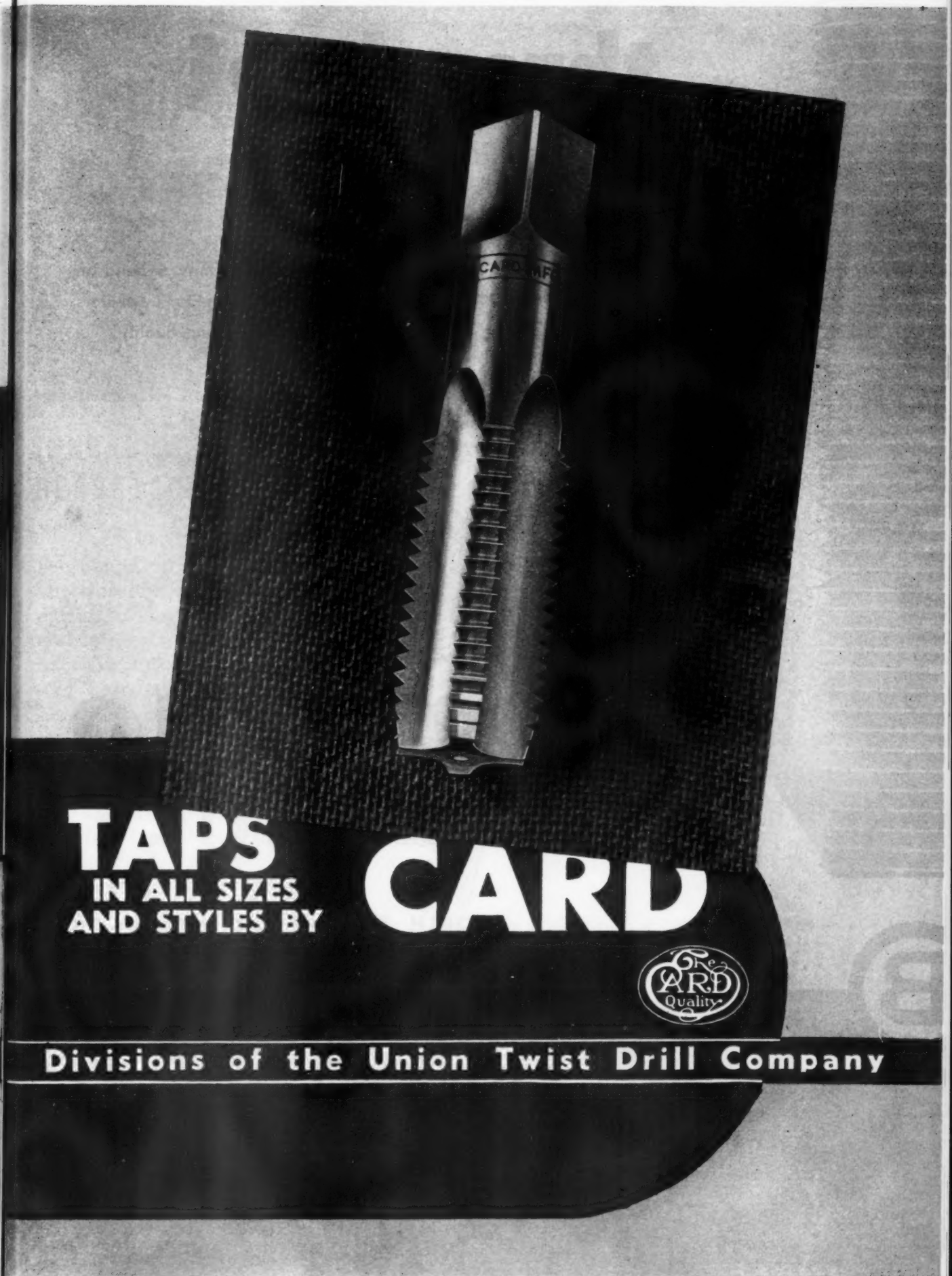
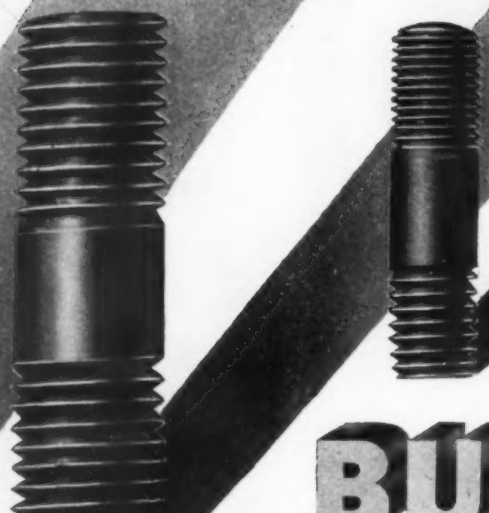

TAPS
IN ALL SIZES
AND STYLES BY
CARD
A.R.D
Quality
Divisions of the Union Twist Drill Company

threads of destiny

THE destiny of an American life or a battle won may depend on the accuracy and reliability of a circle Ⓑ fastener. Our inspectors think of this constantly when they check tolerances and quality.



BUFFALO BOLT COMPANY

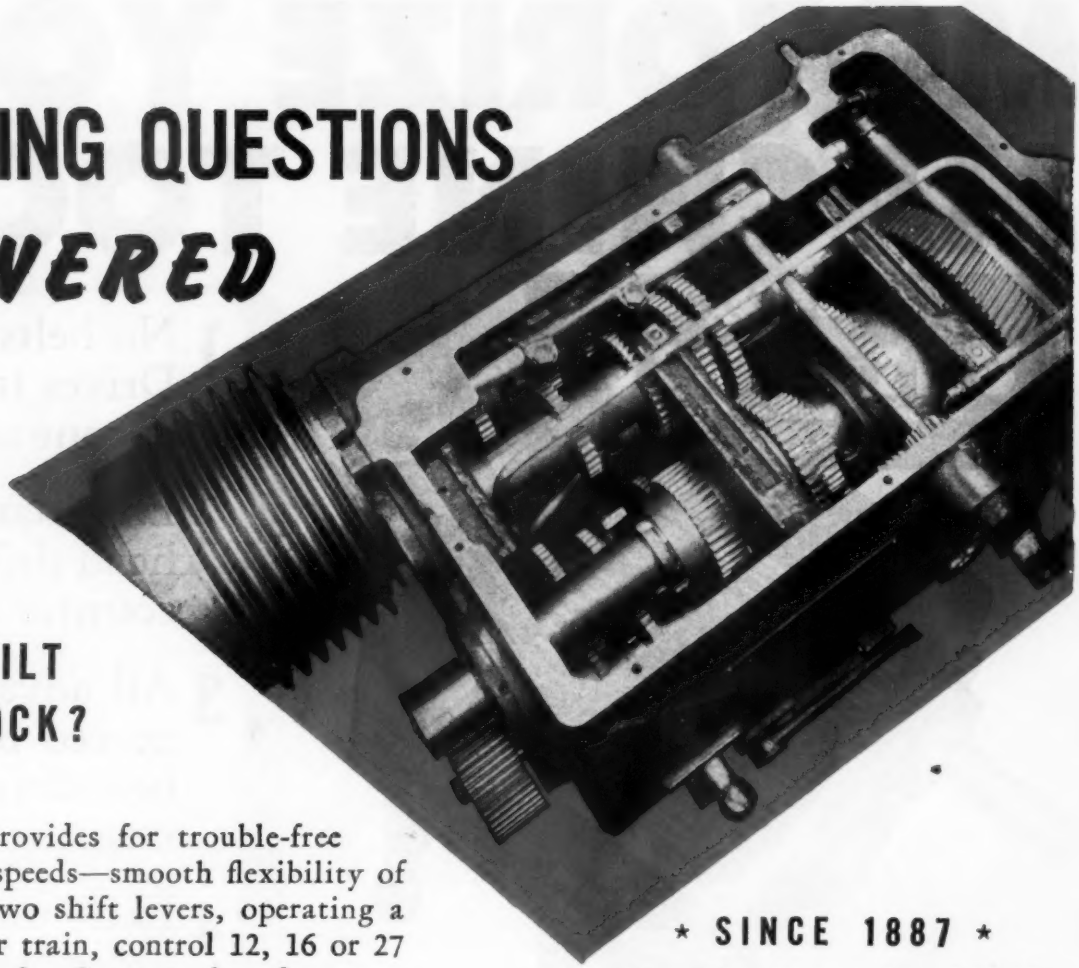
ARMY E NAVY

NORTH TONAWANDA, NEW YORK

SALES OFFICES IN PRINCIPAL CITIES

A few of the machines which give circle Ⓑ bolts their accurate threads.

TURNING QUESTIONS ANSWERED



WHY AN INNERBUILT HEADSTOCK?

Because it provides for trouble-free selection of speeds—smooth flexibility of operation. Two shift levers, operating a multiple gear train, control 12, 16 or 27 selective speeds. Compound and reverse feed gears are incorporated within the head. The compound lever, by multiplying the range of changes, further widens the range of feeds and threads. The chrome nickel alloy gears operate in filtered oil and slide on splined shafts mounted on anti-friction bearings. The Innerbuilt Headstock is just another one of many important reasons why LeBlond lathes are preferred by men who know precision-made machine tools.

★ SINCE 1887 ★

the world has been turning to LeBlond for turning equipment.

LEBLOND FIELD ENGINEERS are prepared to help you in your development work, particularly along the lines of the difficult, the out-of-the ordinary turning problems. The accumulated knowledge of every manufacturing trend in good times and bad —peace and war—gained over a period of nearly 60 years from thousands of installations all over the world, is yours for the asking. Contact our nearest dealer or write Dept. FE 46.

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TURNER
UNI-DRIVE
Motorizes Machine Tools

1 No belts to shift. Drives to large step of cone at all speeds.

2 Eliminates overhead drive and counter shafts.

3 All advantages of geared head, with belt-drive smoothness.

4 Each unit operates independently.

SPEEDS PRODUCTION SAVES TIME • CUTS COSTS

● More speed... greater production... you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift... save time... speed up work... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* motor drive.

Easily and quickly installed. They do away with overhead counter shafts... no belts to shift. Increase the efficiency of machine and operator. Drive on large cone at all speeds. One trial will thoroughly convince you.

Right now — today... investigate TURNER UNI-DRIVE. Write or wire us for full information.

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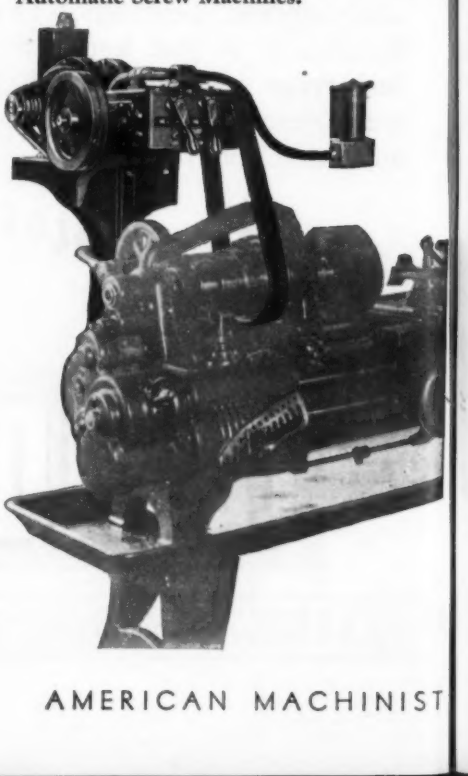

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GENERAL MACHINERY CORPORATION • *HAMILTON, OHIO*

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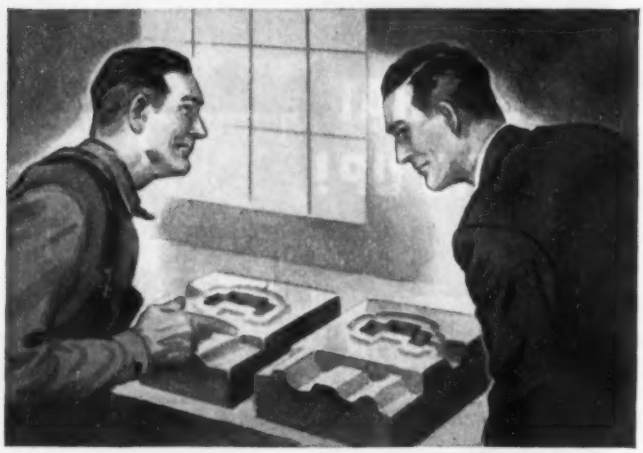
Timely Tip for Tool Engineers

1 "Jim, we're going to need a lot of new equipment quickly—dies, jigs, fixtures, tools. Better check the tool engineers and make a list of what we'll need. I want to get the order in right away."

2 "When you place the orders for this equipment, I'd like to go on record as recommending Brown's tool shop. The quality and accuracy of their work is tops in my book."



3 "See this die? Accurate to a whisker . . . and that goes for everything we get from Brown. The answer's easy . . . they're Pratt & Whitney-equipped throughout—from die sinkers to Hoke blocks—and believe me, you can tell the difference."

There are no two ways about it . . . the better your shop is equipped, the better the quality of your work. That's why the man who is planning new tools for war use now (or for reconversion later) is wise to order them from a shop that has P&W machines, tools and gages. He can be sure of just that much better quality and precision in everything he buys. And usually Pratt & Whitney equipment turns out precision jigs and fixtures faster. Write to us for full information.

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...that help you increase production at lower piece cost!

Circular form tool for form turning.

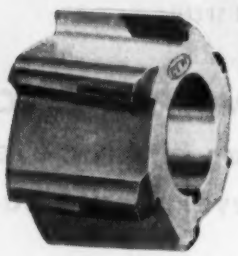
Special two-diameter cutter with inserted blades.

Taper shank pilot reamer.

Cutter for forming bevel on cylinder head valve seat inserts.

Roughing and finishing doming cutters for aircraft cylinder heads.

Tool for forming convex radius.



Shell reamer.

One quick way to new low piece cost in fast-approaching competitive days may be a retooling program that puts greater emphasis on the use of carbide cutting tools. Continental Tool Works engineers, pioneers in the application of carbide, have a unique background of experience in designing and manufacturing carbide-tipped cutting tools . . . a practical experience that is at your disposal.

Get in touch with Continental today!

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DIVISION OF EX-CELL-O CORPORATION

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CUTTING TOOLS

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- Broaches Broach Pullers Broaching Fixtures
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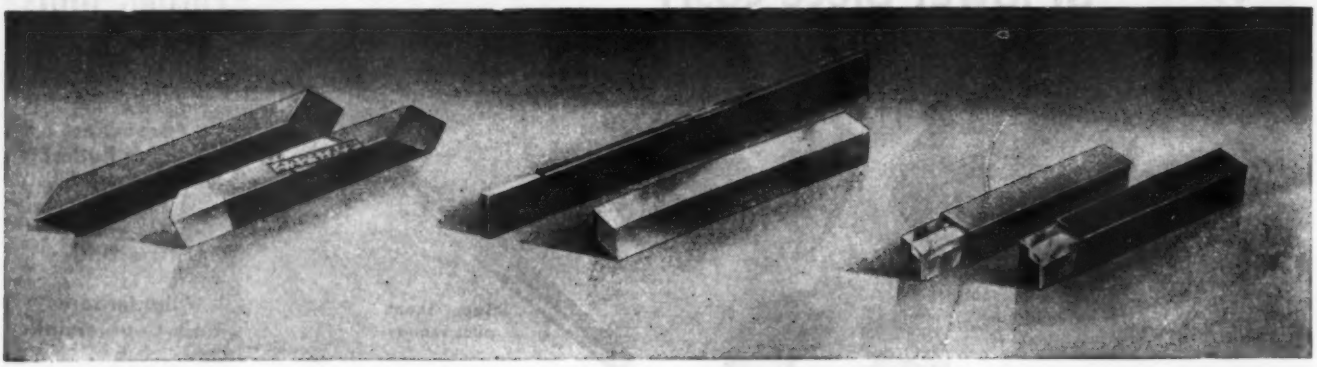
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

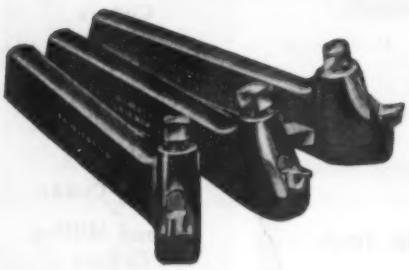
45-53

ARMSTRONG



ARMSTRONG HIGH SPEED | ARMALOY | ARMIDE

Correct ARMSTRONG TOOL HOLDERS and correct Cutter Bits for every machining speed and every machinable material

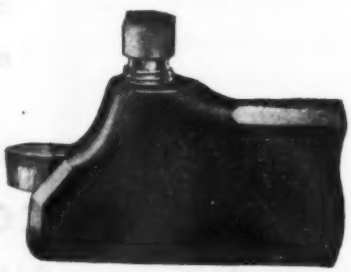


The Armstrong System of Tool Holders provides correctly designed ARMSTRONG TOOL HOLDERS for every operation of lathes, planers, slotters and shapers and for many turret lathes and screw machine operations. It also provides proper types of cutters, bits and blades for every cutting-speed and material.

- For general tool room and machine shop use ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".
- ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.
- ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

ARMSTRONG TOOL HOLDERS for HIGH SPEED CUTTERS

ARMSTRONG CA TOOL HOLDER for ARMALOY CUTTERS



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ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Swift and Sure!

A grinding wheel that cuts cool at high rates of speed, producing amazingly fine tolerances, is only one of the many outstanding products of the Mid-West Abrasive Company.

Engineered quality is built into each of the many items in the broad Mid-West line of classifications—honing and sharpening stones, sandpapers, rubbing bricks, abrasive specialties or wheel dressers.

Let one of the Mid-West staff of experienced field engineers survey your abrasive needs and recommend the items to meet them.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • 1960 E. Milwaukee, Detroit 11, Mich. • Rochester, Pa.

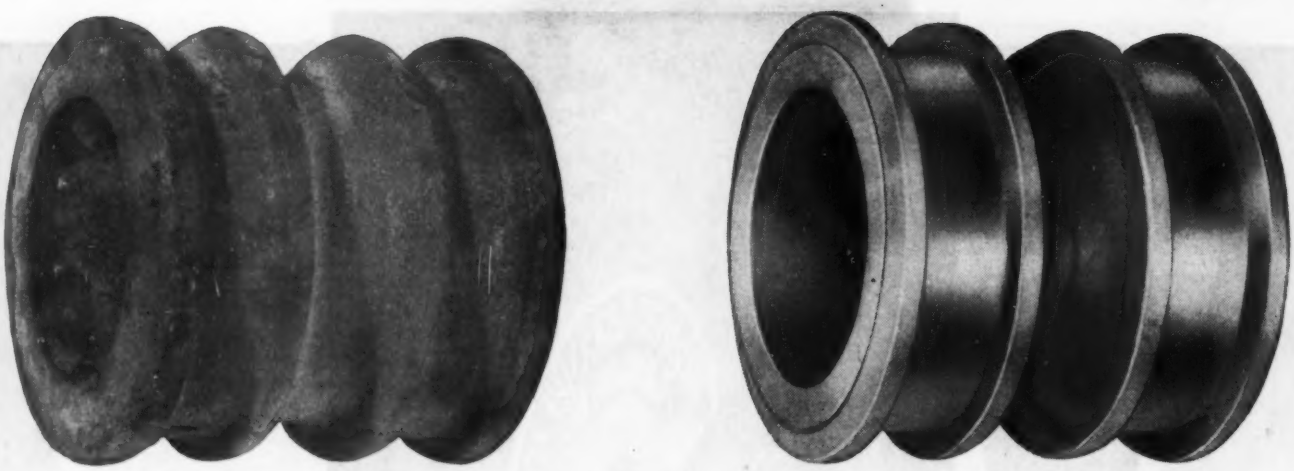
MAIL COUPON FOR FREE POCKET HONE

Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Michigan

Please send me your complete data book on grinding wheels.

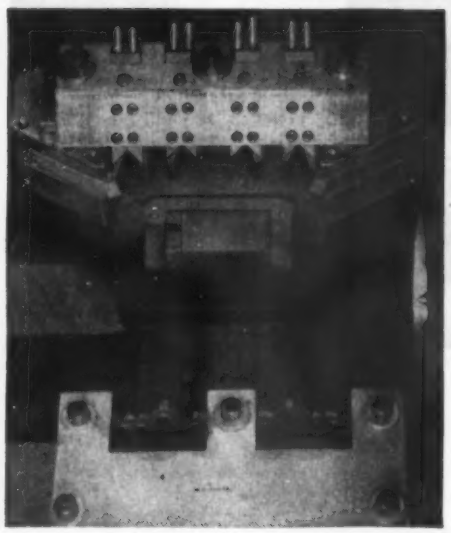
NAME_____

ADDRESS_____



FROM THIS . . . . . TO THIS

IN 4 MINUTES (Floor to Floor Time)

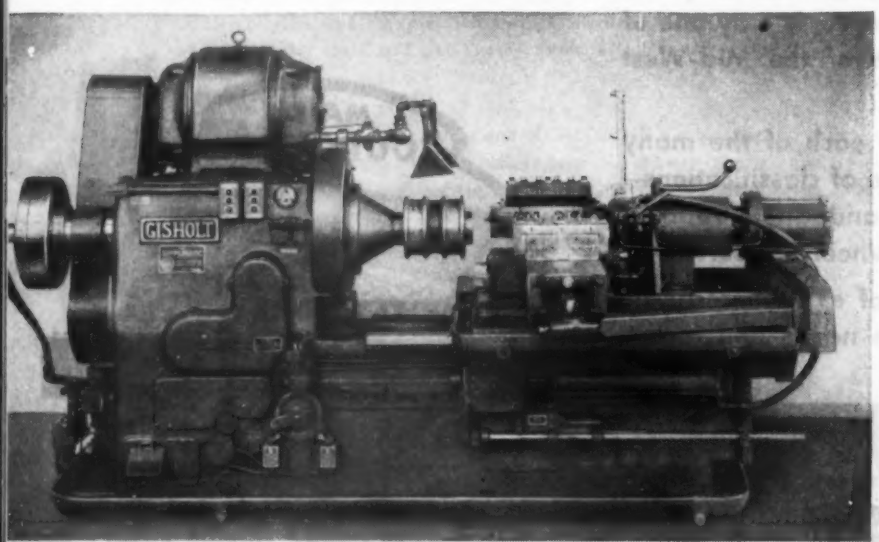


Here's another good example of the way a large number of surfaces can be machined at one time. Gisholt's versatile design permits many variations with two or more heavy duty slides, each with its own drive, its own rate and direction of feed. Yet, all are driven from and accurately timed with the spindle.

These track rollers are machined with 24 carbide tipped tools on 3 slides. Actual cutting time is 2½ minutes using over 40 H.P. Loading, unloading, etc., require 1½ minutes. Total time, floor to floor: 4 minutes.

THE GISHOLT SIMPLIMATIC

The machine shown here is equipped with an expanding arbor operated by a 16″ air cylinder; has a tailstock and three tool slides. It is tooled to machine two sizes of two different types of track rollers. All machine functions are automatic, operated by a single control. An operator can normally tend several Simplimatics. If large volume, low cost machining interests you, write for information about Gisholt Automatic Lathes.



GISHOLT MACHINE COMPANY
1201 East Washington Avenue
MADISON 3, WISCONSIN

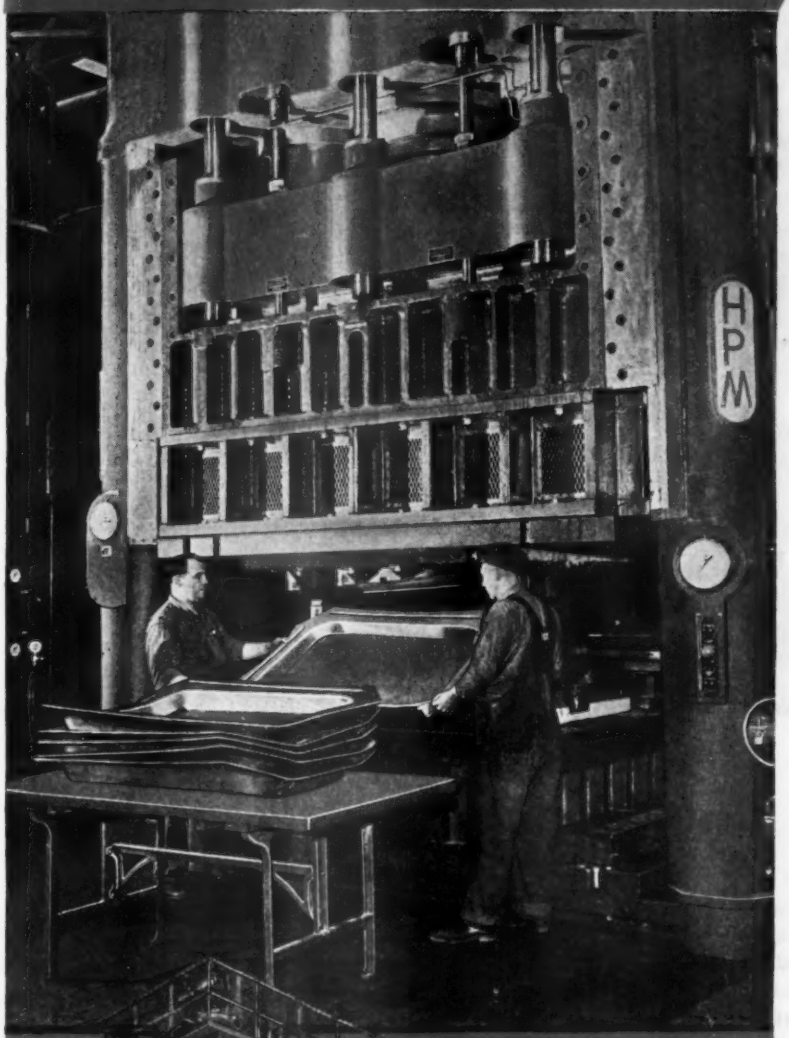
Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

The VERSATILE H·P·M "All-Hydraulic" PRESS

A proven design for the mass production of DEEP DRAWN sheet metal parts ★ ★ ★



● Designed for use with either single or double-action dies, the H-P-M "All-Hydraulic" press has become the production standard for sheet metal forming. Each press is completely self-contained, beng powered by the reliable H-P-M oil-hydraulic power unit. The hydraulic blankholder and die cushion function without additional sources of hydraulic power.

The advantages of the H-P-M press are legion. Check the ten H-P-M press features listed below:

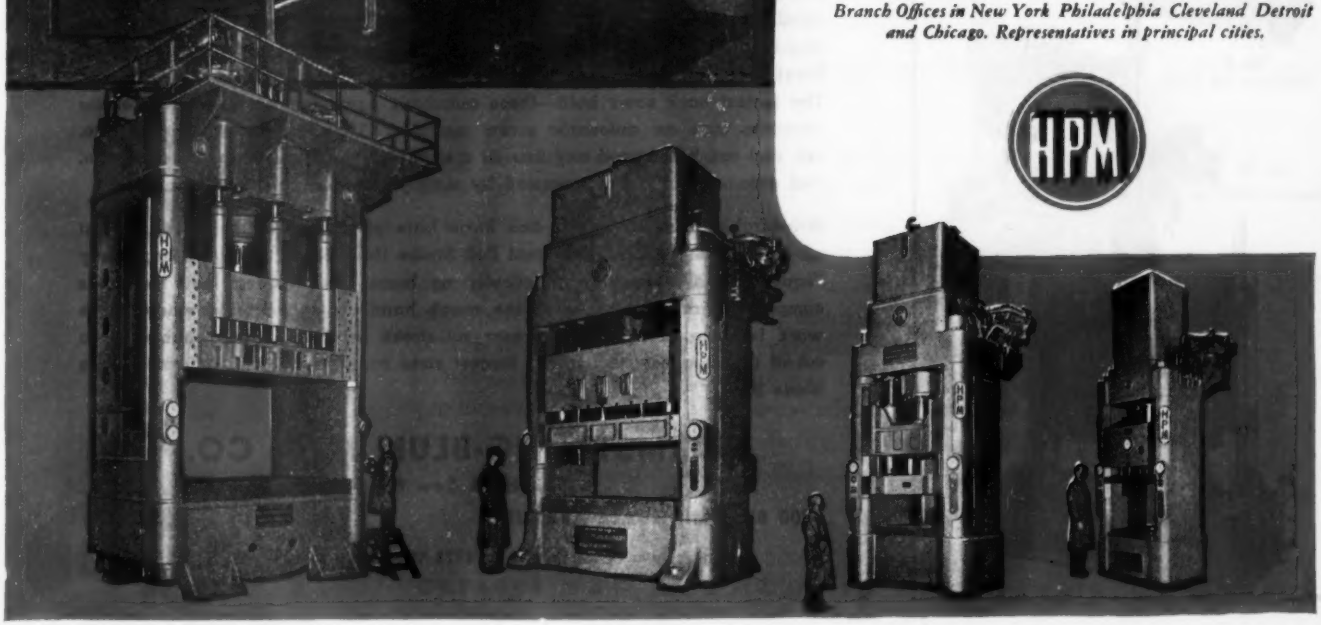
1. Fast action with automatic cycle control.
2. Press reversal at a predetermined pressure.
3. Maximum pressure at any part of the stroke.
4. Convenient hand wheel pressure control.
5. Positive overload protection.
6. Precision hand wheel press travel control.
7. Total elimination of cranks and clutches.
8. Variable speed with automatic slow-down.
9. Closed circuit system with shockless reversal.
10. Blankholder pressure independently adjustable at four corners.

H-P-M presses are built in many sizes. Write today, stating your requirements.

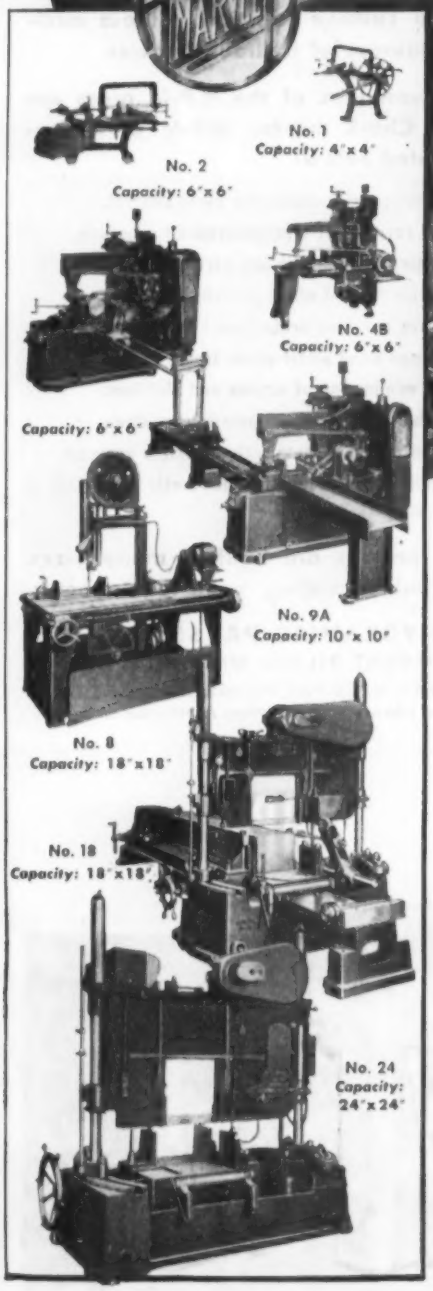
THE HYDRAULIC PRESS MFG. CO.
MOUNT GILEAD, OHIO, U. S. A.

Branch Offices in New York Philadelphia Cleveland Detroit and Chicago. Representatives in principal cities.

HPM



MARVEL SAWS



Steel Warehousing Company, Chicago, features Prompt delivery . . . .

Pieces or lengths cut from bars, tubes or structural shapes can be delivered promptly by this steel warehouse, because they have the MARVEL Saws to handle any cut-off job. Three No. 9A MARVEL Automatic Bar Feed Saws (capacity 10" x 10") which automatically feed, measure and cut-off identical lengths or slices (as gear blanks) from single or nested bars at terrific speed. The fastest hack saws built—these automatic saws require no more operator attention than an automatic screw machine. They are extremely accurate, too, and can be stopped any time in a quantity run, a miscellaneous cut made, and automatic operation resumed by simply re-engaging the bar push-up.

Structural shapes up to 18" and large bars of equal diameters are saw-cut on the No. 18 MARVEL universal Roll Stroke Hack Saws. Cuts are accurately "square" and clean with practically no burrs. This modern saw which is completely armoured to stand the rough handling unavoidable where large work is done, introduces the new roll-stroke principle which enables it to cut-off the toughest steel in the largest sizes rapidly and with extremely long blade life.

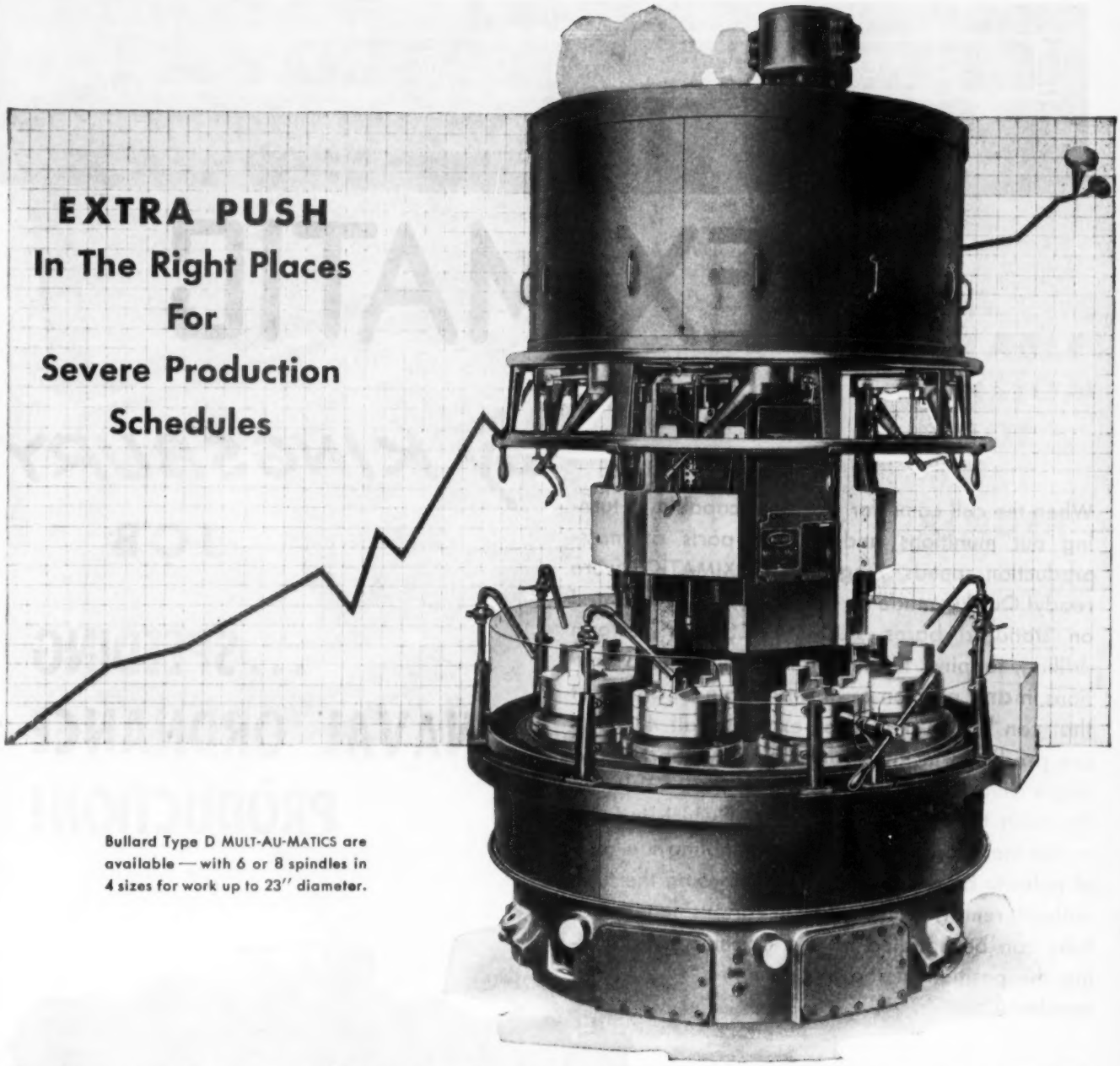
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, U. S. A.**

Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, NEW YORK

EXTRA PUSH
In The Right Places For Severe Production Schedules



Bullard Type D MULT-AU-MATICS are available — with 6 or 8 spindles in 4 sizes for work up to 23″ diameter.

Built to stand strains of high-speed, heavy-feed, tough-metal, long-run operations

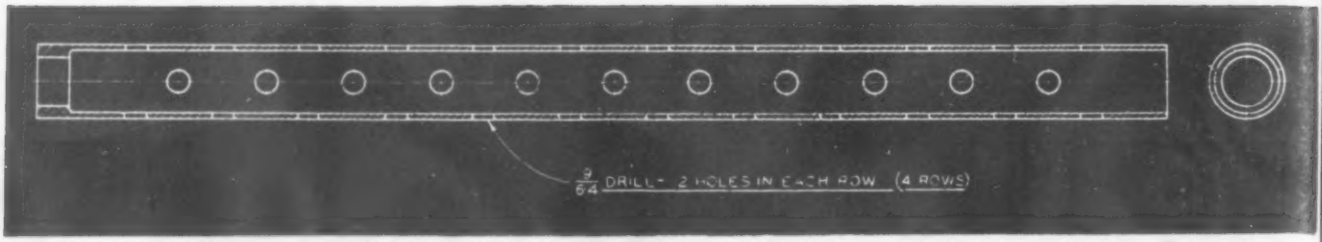
Long life and maintained accuracy in multiple spindle mass production of all classes of castings, forgings and cut-off bar stock are assured by the extreme massiveness and rigidity built into the Bullard Type D MULT-AU-MATIC.

From the rugged base and sturdy carrier that guards alignment accuracy, up through the rigid column to the feed works that assure complete coordination of spindles, tool-carrying heads and indexing . . . this unified heavy construction is accurately controlled to meet every demand for efficient operation.

For complete details about the way the Bullard Type D MULT-AU-MATIC produces one finished piece (or two) within a few seconds of the time of the longest single boring, turning, facing, grooving or drilling operation, write today for Bulletin MAM-D. The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE



FLEXIMATIC

by KINGSBURY

JOB

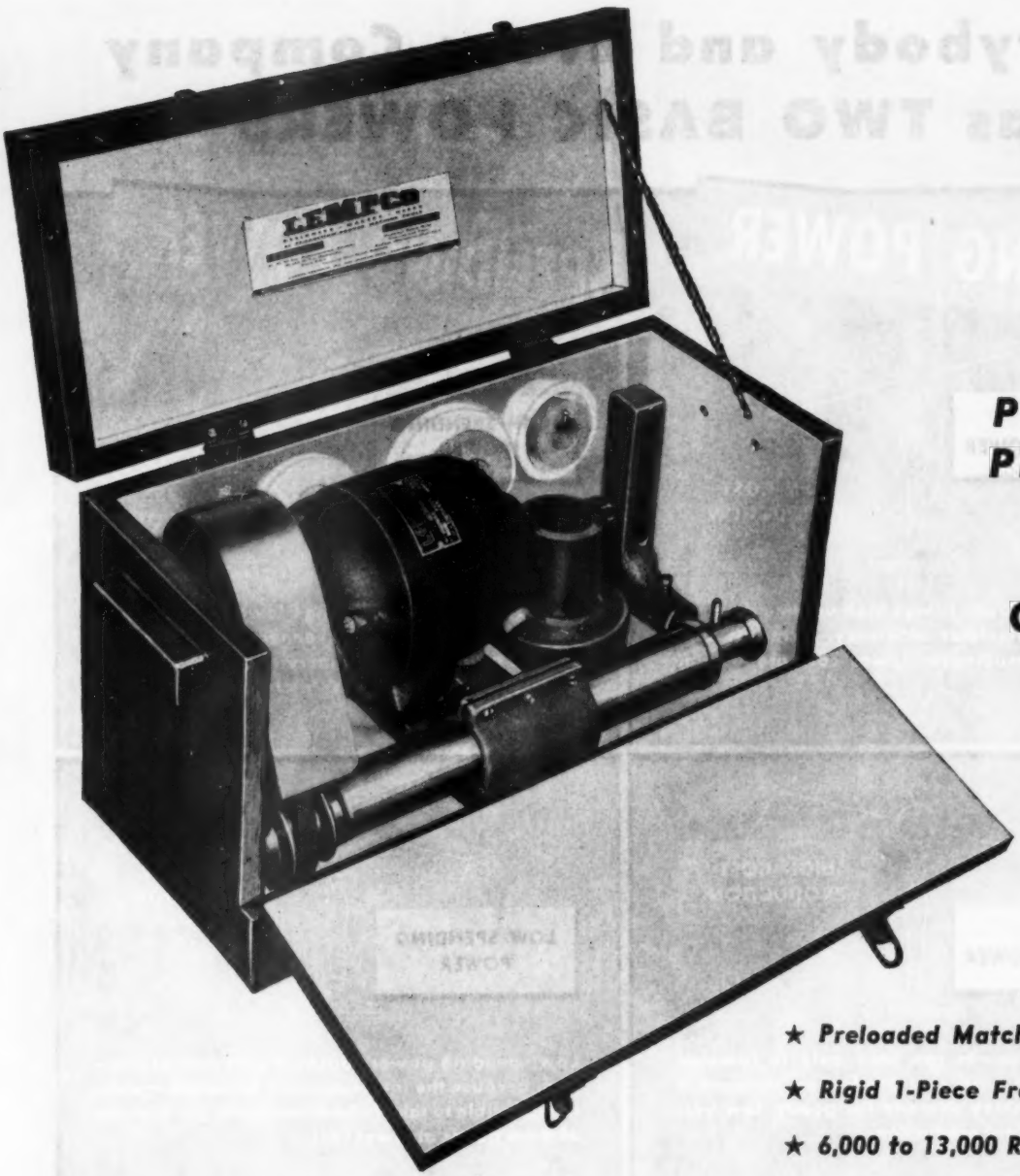
...SPEEDING NAVAL ORDNANCE PRODUCTION!

When the call came for machines capable of turning out munitions and aircraft parts at mass-production speeds, Kingsbury FLEXIMATICS were ready! Quickly made up of standard units mounted on standard bases. FLEXIMATICS can perform drilling, tapping, reaming and many other operations in **any** position or at **any** angle on **any** part that can be chucked. For example, all 48 holes are produced in the flash tube shown above in a single chucking of the work. Each work holder on the main turret is in itself a turret which indexes as the main turret indexes, thus enabling the rows of holes to be drilled at four positions on the tube without removing the work. Various lengths of tube can be handled by the machine by adjusting the position of the top clamping member.

Speeding war production by making it possible for semi-skilled labor to turn out large volumes of precision parts, Kingsbury FLEXIMATICS possess the added advantage of FLEXIBILITY that permits quick, easy changeovers to meet changes in design or machining requirements.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



A PORTABLE PRECISION TOOL POST GRINDER

★ *Preloaded Matched Sets of Bearings*

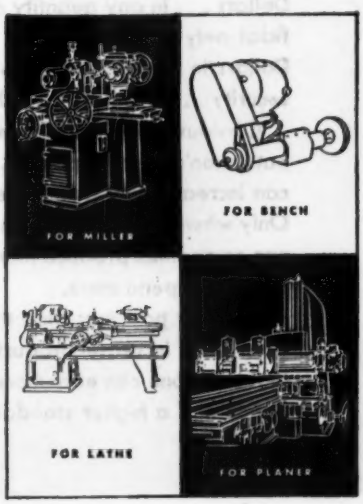
★ *Rigid 1-Piece Frame*

★ *6,000 to 13,000 R.P.M. Spindle Speeds*

FOR ANY LATHE ★ PLANER SHAPER ★ MILLER ★ BENCH

May be used efficiently and effectively on the bench, or on a lathe, shaper, planer, or miller — and it can do a multitude of jobs on each and do them fast and accurately. You get the equivalent of two different length quills at no extra cost because of the exclusive Lempco construction which enables both the motor and the grinding quill to be adjusted 2" in or out. Available in a handy fitted chest that is easy to carry.

WRITE FOR SPECIFICATIONS—CEILING-PRICED

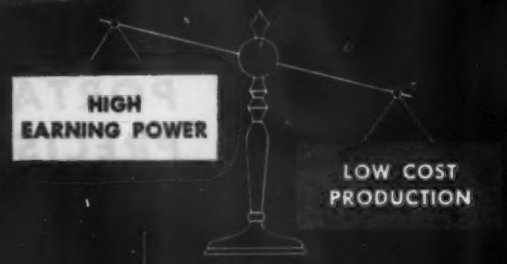


LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

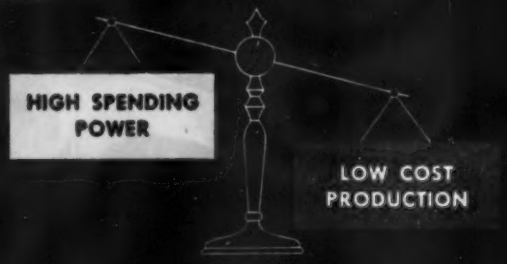
Everybody and Every Company Has TWO BASIC POWERS—

EARNING POWER

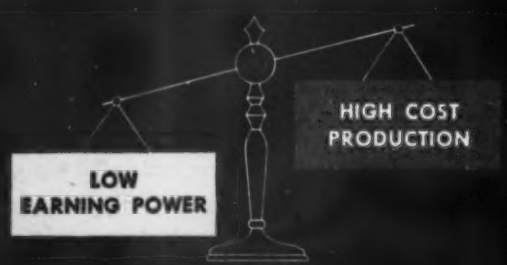


High earning power brings high volume demand for goods—stimulates efficiency, increases unit production, resulting in lower cost production.

SPENDING POWER



High spending power brings lower cost production because it stimulates keener competition and the use of efficient machinery and methods. Low cost production means more goods—higher standards of living.



Low earning power can lead only to lowered efficiency and high cost production because it means diminishing demand for goods, low volume, less efficient production.

Low spending power causes higher cost production, because the lower demand for goods makes it impossible to take full advantage of the making of more goods at lower cost.

SPENDING POWER—*Is the Key to Security Through Full Employment*

Dollars . . . in any quantity at any time . . . are beneficial only when they are in use . . . being spent. Dollars in use . . . being spent . . . provide jobs . . . security . . . prosperity . . . higher standards of living.

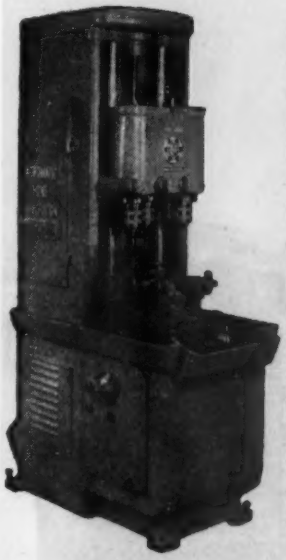
Obviously, individual spending power depends on each man's earning power . . . and his earning power can increase only as he is enabled to produce more. Only when the individual earns more and spends it . . . can companies produce more . . . earn more . . . hire more and spend more.

The only post war plan that any of us can depend upon is to increase production per man per hour so that everyone can earn more, spend more, have more goods and a higher standard of living.

MICRO MATIC

MICROMATIC

MAKERS OF



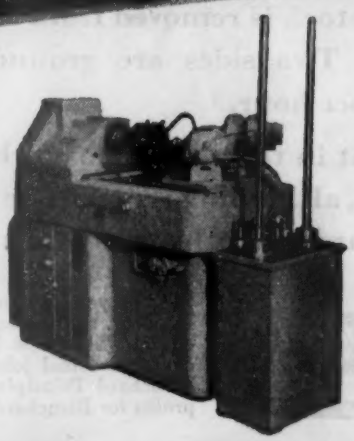
Micromatic Model 705 Multiple Spindle Vertical Hydrohoner Machine with built-in automatic Microsize Control. For internal honing. Rotary indexing work table provides high production. Usually recommended for maximum stock removal ranging from .0005″ to .0015″ on hardened parts—.001″ to .010″ on soft or medium hard. Bores from ¼″ to 2″ diameter. Microsize control gauges work automatically. Work is held uniformly within tolerance of .0003″. Honing cycle is automatically stopped when correct size is reached.

Micromatic Horizontal Floor Type Hydrohoner for internal or external honing. Tool operates either under hydraulic or manual control. Tools available to generate either crosshatch or co-directional finish patterns. Full floating tool action. Stock removal .0015″ to .002″—precision generated size limits .0003″. Corrects error for taper to within .0001″ limit. Size of work accommodated 1″ up.

THESE MACHINES NOW ON WAR WORK *Will Add to* SPENDING POWER WHEN PEACE COMES

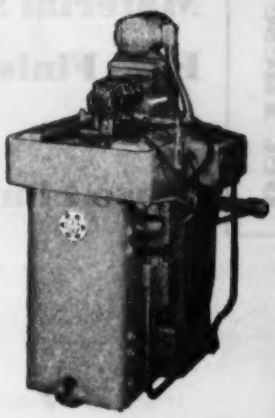
By Producing MORE GOODS at LOWER COST

Micromatic Model 702 Vertical Hydrohoner Machine. Standard single spindle type—built for rapid production honing of bores or cylindrical surfaces up to 2″ in diameter.



Micromatic Ball Stud Honer—generates precision sphericity without measurable error on ball studs. Removes .030″ stock on diameter from turned heat treated forging.

Micromatic Horizontal Honer working on production honing of silver plated bearings. On this non-ferrous honing job the Micromatic Machine reduced costs 50% from previous methods.



HONE CORPORATION DETROIT 4, MICHIGAN

HONING MACHINE TOOLS

NO. 11 BLANCHARD SURFACE GRINDER ▶

"Put it on the Blanchard"

Get These Advantages

- **Production ✓**
- **Adaptability ✓**
- **Fixture Saving ✓**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits**

These cast iron bushings are held on the magnetic chuck and because of their height, almost twice their diameter, they need to be securely blocked by steel parallels and blocks.

The outside diameter of the bushings is 1⅜" and the inside diameter ¾" and they are 2½" long.

.010" of stock is removed from each end to limits of ±.005". Two sides are ground, 60 pieces (120 surfaces) per hour.

Note that in this, as in most other setups on the Blanchard, all holding is magnetic and the machine can be cleared for other work in a few seconds.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

BOILED DOWN

TO SIMPLIFY MOTOR SELECTION

● This new booklet gives ratings, sizes, characteristics, dimensions, where-to-use data, *and prices* of General Electric a-c and d-c motors, 1/16 to 75 hp. Everything you need to know to select these sizes—all in 16 pages!

Builders of TRI/CLAD Motors

Buy all the BONDS you can—*and keep all you buy*

To Save Your Time Later Mail This Coupon Today—

General Electric Company, Schenectady 5, N. Y.

Please send me a copy of your Condensed Motor Catalog (No. GEA-4281).

Name.....

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750-288-488

GENERAL ELECTRIC

*Suggestion Number Two**

FOR REDUCING CONSUMPTION OF STEEL CUTTING CARBIDE

* *Suggestion Number One was Kennametal "Universal" Blanks*

USE A LIGHTER KENNAMETAL TOOL, IN A "HOME-MADE" ADAPTOR, ON FINISH-TURN OPERATIONS

Efficient use of carbide tools—always important—is imperative today, because of the demands of a large shell-making program. Every possible means for promoting economy should be utilized to avoid tool shortages, and consequently delayed production.

On most finish-turn operations carbide can be conserved, and tooling costs can be reduced, by using tools 1" square or smaller, mounted in the tool block by means of a simple adaptor which can readily be made in any shop. For example, in a major shell-plant, the finish-turn operation on a 155mm shell, using a 1½" square-shank Kennametal-tipped tool, required .72 calculated grams of Kennametal, at a tool cost of 8¢ per shell—very economical production. Yet, by using a ¾" square-shank Kennametal-tipped tool in an adaptor, carbide consumption was cut in half (.36 calculated grams), and tool cost was reduced to 3.3¢, per shell finish-turned.

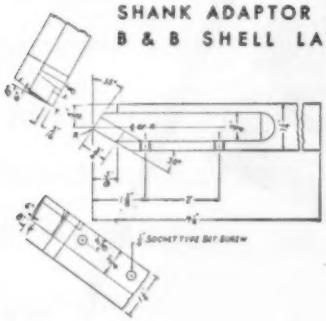
The diagrams at the left show how ¾" square-shank tools can be mounted in adaptors that fit tool holders built to take shanks 1¼" or 1½" wide. Similar adaptors can be devised and made by you for other conditions. On lathes built to take tool shanks 1" x 1½", or 1" x 1¾", it is economical to use a ½" or ¾" shim under a 1" square-shank Kennametal-tipped tool.

By using inherently efficient Kennametal, in conservative size blanks, as suggested above, a two-way saving in carbide consumption can be effected.

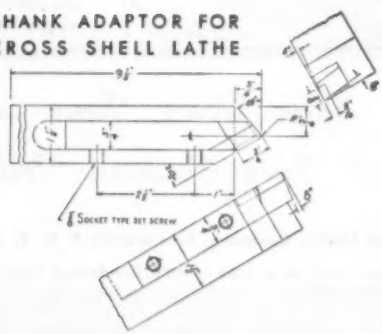
Kennametal engineers, fully experienced in the application of cemented carbides, will be glad to help manufacturers get the best and longest tool service in shell production.

TWO TYPES OF ADAPTORS THAT YOU CAN EASILY MAKE*

SHANK ADAPTOR FOR B & B SHELL LATHE



SHANK ADAPTOR FOR CROSS SHELL LATHE

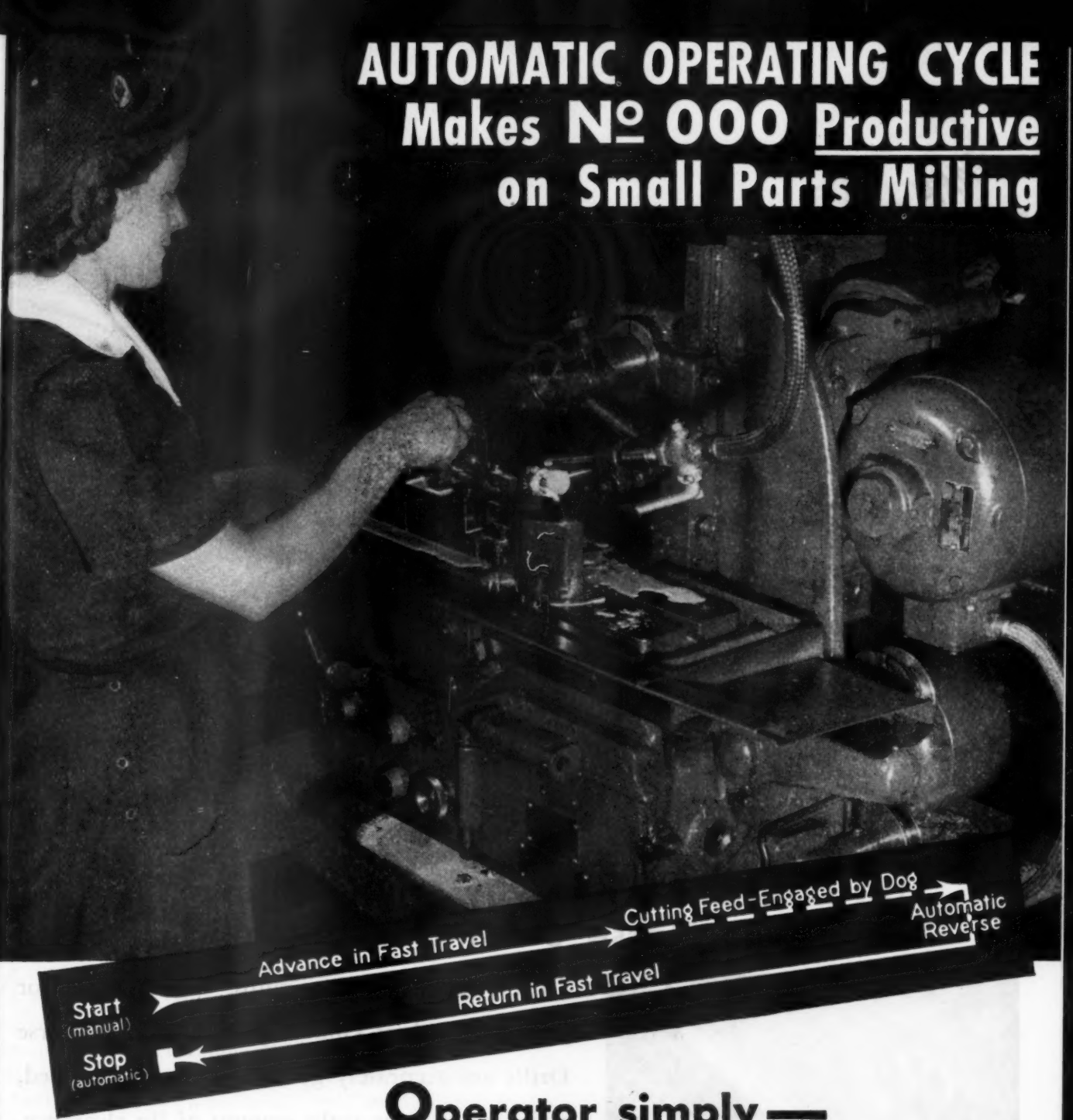


* Kennametal Inc. does not manufacture or sell adaptors. The sketches above are typical suggestions for making your own adaptors. Blue prints from working drawings will be furnished on request.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL *Inc.*, LATROBE, PA.

AUTOMATIC OPERATING CYCLE Makes No. 000 Productive on Small Parts Milling



Operator simply—

1. Loads work
2. Pulls starting lever
3. Unloads the completed piece

—and with this fast cycle you obtain

Minimum non-cutting time
Accuracy of feed engagement
Accuracy of table reverse

Ask about the No. 000 Plain Milling Machine's many features for **High Output** with **Maintained Accuracy.**

BS BROWN & SHARPE MFG. CO. PROVIDENCE 1, R. I., U. S. A.

BROWN & SHARPE

..and you'll see why costs go down when Morse Cutting Tools go in!

See the length of these chips. Here's proof for you . . . the best kind of proof . . . that Morse Drills are accurately ground, uniformly angled, and have just the right amount of lip clearance. Try them! They'll cut down work and tool spoilage . . . reduce down-time . . . make a *noticeable* difference in your production costs!

TO REDUCE COSTS, SPECIFY MORSE CUTTING TOOLS

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

SAN FRANCISCO STORE: 1180 FOLSOM ST.

the final *check* for every rotating part...

MAYBE it's a crankshaft or an armature . . . perhaps a fan or belt pulley. No matter. The important thing is this—if it isn't *balanced,* it isn't ready for service.

Smooth operation and long life require that accurate static and dynamic balance be rated right up with mechanical specifications—incorporated in the blueprints. Then no vibration, however slight, may lower the efficiency of the finished product.

GISHOLT DYNETRIC BALANCING MACHINES* use electronics to detect unbalance vibrations as small as .000025" . . . handle any rotating assembly from one-half ounce up to 50 tons! In a matter of seconds, the destructive forces are *located, measured* and *ready for correction.*

The cost? Very moderate. That's why so many manufacturers insist that their products have the final check which only Gisholt Balancing Machines can provide.

* *A development of Westinghouse Research Laboratories*

DYNETRIC BALANCING MACHINES *put modern electronics to work to track down the elusive forces of unbalance. In ridding your product of these destructive forces, they eliminate the risk of overloaded bearings and premature wear due to vibration.*

GISHOLT MACHINE COMPANY

1201 East Washington Ave., Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

You can see errors instantly with THESE INSPECTION TOOLS

The GAERTNER TOOLMAKERS MICROSCOPE

You can't miss errors magnified 30 times. Any gage, tap, template, hob, etc., etc., when checked in the Toolmakers Microscope will instantly show any deviation from correct contour or dimension at any point. You can check all thread measurements, angle measurements, types of work otherwise difficult to check, flat or round, and readily duplicate measurements within 1/10,000".

A laboratory instrument? Yes—but sturdily built for general daily manufacturing use. Write for details and quotation.

The WILDER PROJECTOR

Throws a magnified shadow image of the part under inspection against an enlarged drawing of part. Magnifications available, 10x to 100x. Horizontal work table for flat work. Center support and micrometer cross slides for checking forming tools, screw threads, hobs, etc.

The Wilder Projector eliminates all errors due to measurement by "feel". May be speedily operated, with little or no experience. Prevents costly mistakes and insures initial correctness from the start of a production run. Price within means of all shops. Write for data and quotation.

WHEN IN NEW YORK, VISIT THE SCHERR DEMONSTRATION CENTER. See and inspect new tools that enable highest accuracy standards at new low costs, and are setting new pace in manufacturing everywhere.

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

If you're wondering about the formability of Alcoa Aluminum

Quite a forming job, spinning this venturi tube in one piece. Don't ask how they did it; we're not in on the secret. But we can assure you the part is seamless, made by spinning a single disc of Alcoa Aluminum sheet.

Quite a compliment, too, for the material that can take that kind of forming. Credit this quality to the many years devoted to development of Alcoa Aluminum Alloys suited to that kind of work. Credit it to the manufacturing skill responsible for turning out that kind of metal consistently.

To be sure of the best, write ALCOA Aluminum into your specifications. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.

Aluminum venturi tube spun from a single disc by Feick Manufacturing Company of Cleveland.

FIRST IN **ALCOA ALUMINUM**

only Apex
gives maximum strength and endurance with minimum wear!

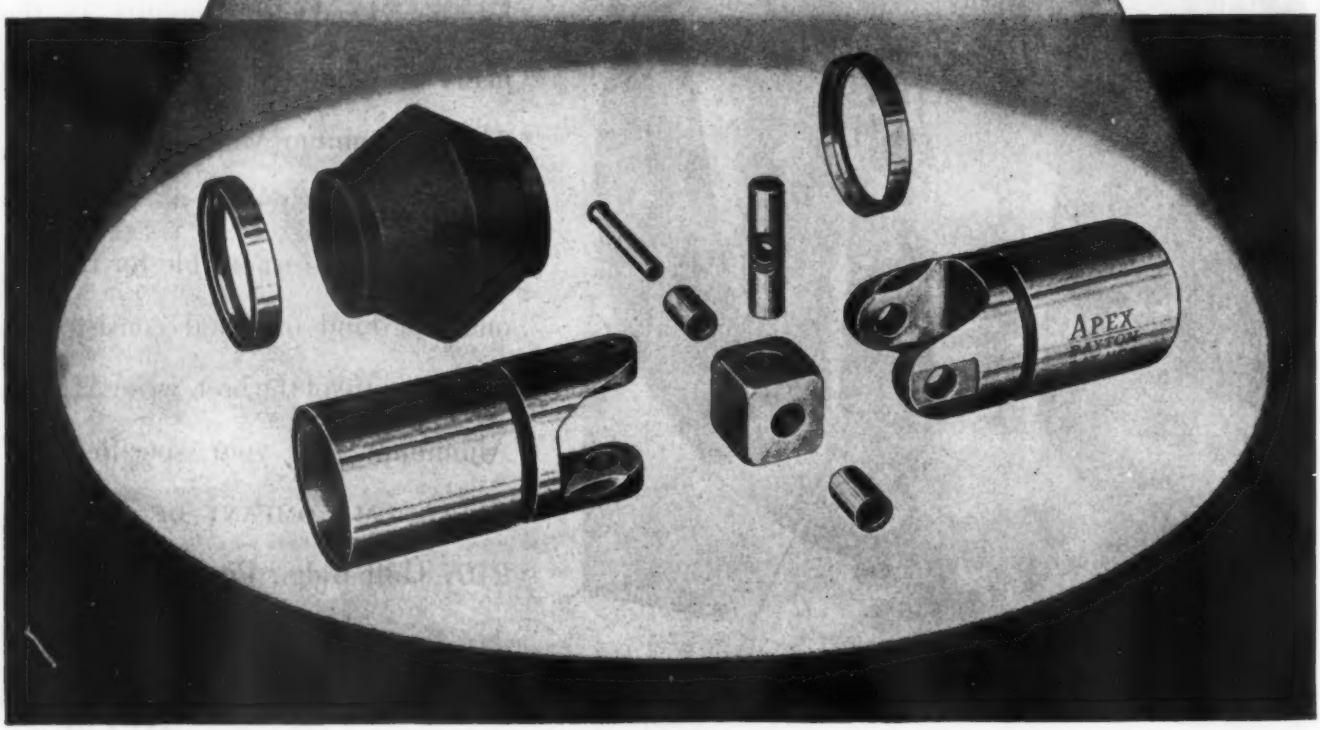
Balanced design gives the Apex Heavy Duty Joint the following advantages: the highest strength (axial and torsional) weight ratio of any joint in its class; the highest resistance to vibration and fatigue failure; ability to withstand temporary torsional overloads as great as 80% of rated ultimates and temporary axial overloads up to 150% in excess of rated ultimates.

The exclusive, flexible Apex cover provides a unique "Winterization" method and multiplies joint life many times. This cover seals lubrication in, seals troubles out and is in full compliance with AAF Winterization directives.

For commercial applications this joint will reduce your maintenance costs over any other joint on the market.

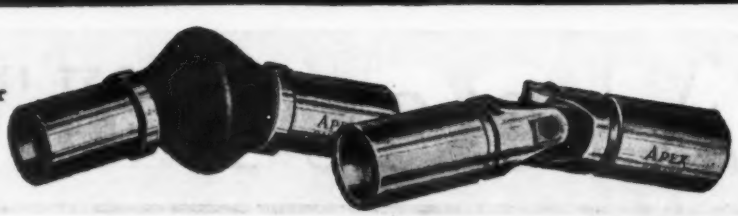
Furnished in sizes from ½" to 1½" —with torque ratings up to 14,800 inch pounds—in all standard sizes or in specials engineered to your needs. *Write for Bulletin No. 103.* **The Apex Machine & Tool Company, Dayton 2, Ohio.**

APEX
UNIVERSAL JOINTS



APEX PATENT NUMBERS

Patent No. 2,264,727—Heavy Duty Design
Patent No. 2,264,728—Lubrication Retaining Cover
Patent No. 2,290,776—Lubrication Retaining Seal
Patent No. 2,302,272—Pinning Construction
Patent No. 2,369,810—Pinning Construction
Other Patents Pending



You know him, Pal, as the man who took you for a run in the park when the leaves were falling. He's the tweed-suited chap who wrestled with you on the floor or read the paper while you stretched out at his feet. He's the fellow you're waiting for.

We knew him, too, when he was on the payroll of an *Industrial Supply Distributor. It was he who used to be such a big help to this firm's customers . . . getting them *what* they wanted *when* they wanted it. By telephone and telegram he somehow managed to locate the hard-to-get equipment and supplies that were so desperately needed.

Even in his absence, the *Industrial Supply Distributor is still the mainstay of American Industry—maintaining a centralized, convenient source for all sorts of tools, machinery and materials. Today, as always,

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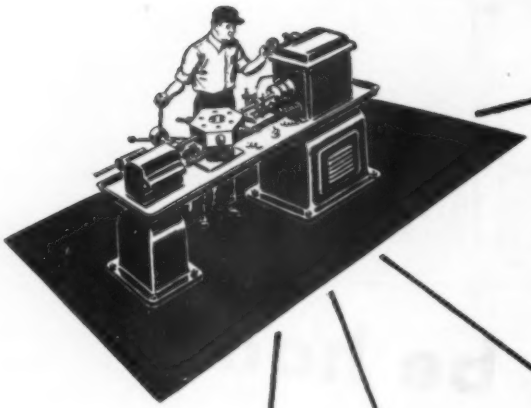
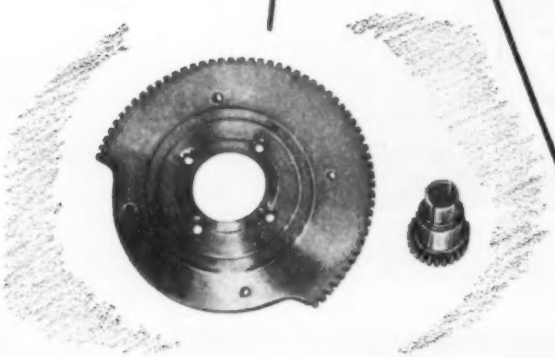


THESE AIRCRAFT cable terminals require clean turning, threading, drilling and milling. The uniformity of Carpenter Free-Machining Stainless #8 (Type 303) was a big factor in maintaining volume production on these parts.

THIS FINNED aircraft spark plug is an excellent example of the results obtainable with Free-Machining Stainless #5 (Type 416).



HERE'S ANOTHER good example of vital parts for war equipment made from Carpenter Free-Machining Stainless bar stock. Rejects on Stainless parts such as these, used in a torpedo directional mechanism, are reduced to a minimum when Carpenter Free-Machining Stainless #8 (Type 303) goes on the job.

IF YOUR Stainless machined parts require extremely close tolerances, take a tip from these aircraft carburetor parts. Carpenter Free-Machining Stainless #8 (Type 303) met rigid machining requirements, yet maintained the tremendous production volume necessary.

YOU GET CORROSION RESISTANCE

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EASY, LOW-COST MACHINING

WITH CARPENTER STAINLESS

IF YOU'RE like a lot of product designers we know, you've said to yourself; "Of course, I'd like the corrosion protection and other advantages of Stainless for my new or redesigned products. But what about the machining cost?"

Our answer is "Try Carpenter Free-Machining Stainless and then take another look at the cost sheet." Others have found by using Carpenter Free-Machining Stainless that they can speed output, cut rejects and often eliminate further finishing operations.

Here's why. Carpenter Free-Machining Stainless bar stock is consistently uniform. It cuts free and clean and works the same, bar after bar. That means longer tool life between grinds, less tool breakage, lower tool costs. It means faster, easier production right down the line.

If you haven't already tried Carpenter Free-Machining Stainless Steels, be sure to do so. Through their use, you can obtain all the advantages of Stainless at less cost.

Your nearby Carpenter representative would like to tell you more about these easy-to-machine Stainless Steels. Why not call him in today?

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SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

10 Q. *"How often should the oil filters of a grinding machine be drained to keep it working right?"*

A. Most machine manufacturers recommend that the oil filters be drained or the filtering element be cleaned every two or three weeks. Otherwise, they cease to act as filters.

11 Q. *"When truing a wheel with a diamond do you do it any differently for a high finish than you do for fast stock removal?"*

A. Yes, if a high finish is required on the work, move the diamond across the face as slowly as possible. On the other hand, if fast stock removal is the objective, you can work the diamond across the face at a higher rate of speed.

12 Q. *"Will you please give me a check list of the most common causes of chatter marks in throughfeed centerless grinding?"*

A. The presence of chatter marks on the work in throughfeed centerless grinding can usually be traced to one or more of the following causes: (1) Using a grinding wheel of too fine grain; (2) using a grinding wheel that is too hard; (3) using a work support blade at too steep an angle; (4) grinding too high above the centerline of the wheels; mount of grinding wheel fitting too loosely on spindle; (5) grinding wheel out of balance; (6) improper spindle adjustment of either the grinding or regulating wheel; (7) attempting too heavy stock removal; (8) improperly clamped blade; (9) excessive play in any part of the machine or equipment; (10) dressing the wheel with a flat diamond.

13 Q. *"What is considered a good rate of production in the grinding of automotive gear teeth by the formed wheel method?"*

A. From information we have been able to gather, it appears that the average rate for the formed wheel grinding of automotive and similar gear teeth lies somewhere between 40 and 45 seconds for each tooth. The factors which can affect this average rate one way or the other are the number of teeth to be ground, the size of the teeth, amount of stock to be removed and, of course, the skill and aptitude of the machine operator.

14 Q. *"We have recently taken on a contract to grind electric motor shafts. We are planning to use an 18 x 2 x 5 wheel. Have tried several wheels of different grain and grade, but to date have not met with much success. What do you recommend in a Dayton wheel?"*

A. We have met with quite some success in supplying wheels for the grinding of electric motor shafts. Drawing on this experience, we recommend our 5A-60-N-13-V-20 (old marking 560 N-3-V).

15 Q. *"We have just started on a new centerless job. When the work leaves the machine after being ground the front end of it has a slight taper. How do you correct this?"*

A. A taper on the front end of the work as it leaves the machine is caused by work guides on the entrance side of the machine being deflected towards the regulating wheel. Vice versa, a taper on the rear end of the work is caused by the work guides on the exit side of the machine being deflected towards the regulating wheels.

16 Q. *"We have just received a shipment of thread grinding wheels from a new supplier and notice that a few of the wheels have a slightly ground out spot in the heavy part on one side. Would you consider this wheel as being defective?"*

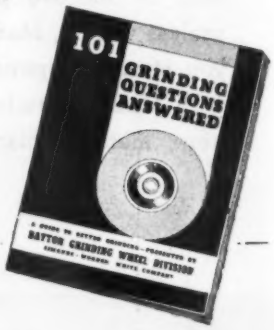
A. Every thread grinding wheel manufacturer frequently finds it necessary to grind a small amount from the heavy part on one side of a wheel in order to correctly balance it. Such wheels are not defective as they do not affect results in any way.

17 Q. *"To settle an argument, what is the ideal diameter of a wheel used for straight internal grinding?"*

A. When the wheel is new it should have a diameter equal to ¾ of the diameter of the hole being ground. A smaller wheel would slow down production too much, whereas a wheel very much larger would not easily go into the hole.

READY NOW...a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



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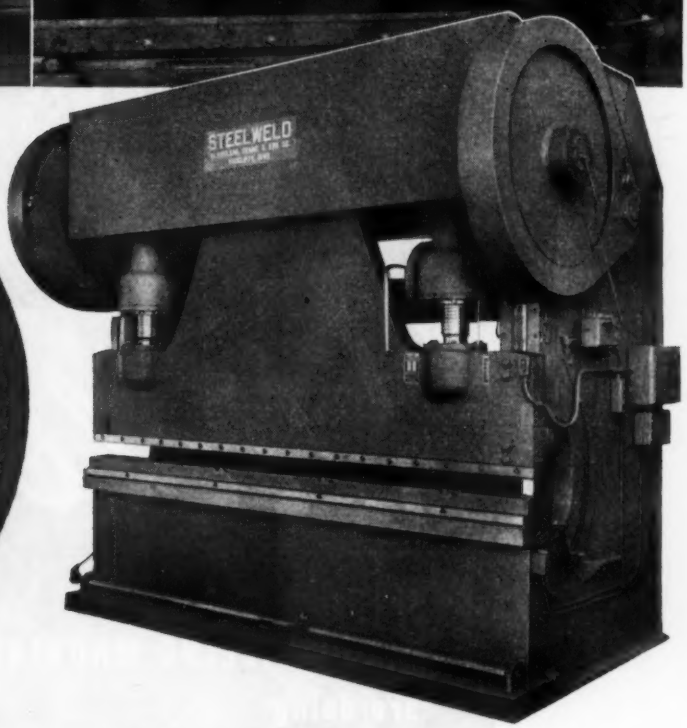

Above Left:
Bending a 10′ x 5/8″ steel plate.

Above Right:
Forming a drawer of 16 gauge steel. Corners produced are straight, sharp and accurate.

You can shift from braking operations on 20 gauge plate to ½ inch or 1 inch plate all in the matter of a few minutes with Cleveland Steelwelds. Size of plate makes no difference as long as you keep within the tonnage rating of the machines.

If yours is a jobbing shop or plant where only a small number of any part is produced, you will find the versatility of Steelwelds advantageous. Equally satisfactory are these presses for mass-production runs of thousands of similar pieces.

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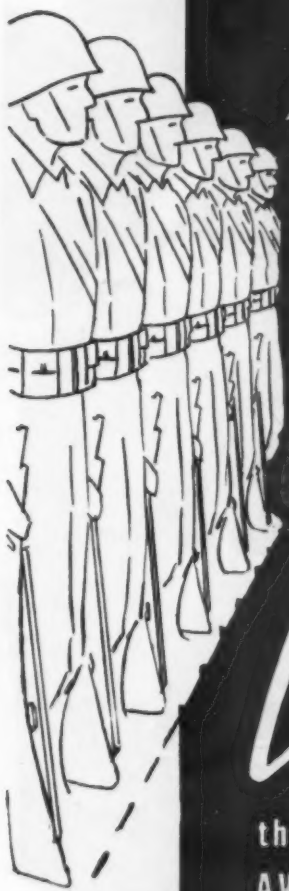

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"Know There's a War On"

UNDER war pressure, Warner & Swasey Turret Lathes are being pushed far beyond the limits normally accepted as good practice. In many war plants, life of machine tools is deliberately sacrificed to push up production, fast!

For example, one firm, in order to "hog off" heavy cuts on tough steel forgings at high speed, replaced original equipment with drive motors of double the horsepower. This imposes excessive strain and wear that would be inexcusable under normal circumstances, but the battery of heavy duty Warner & Swaseys is taking it beyond expectation, and production is hitting new highs.

Another nationally known manufacturer of a vital war part had estimated 700 pieces per day as top production on his Warner & Swaseys. Under pressure for greater production he put greater pressure on his machines. He increased speeds and feeds of his Warner & Swaseys, changed tool rake, and boosted the output to almost double the original estimate.

The way Warner & Swaseys have stood up under this punishment in many war plants is a tribute to both the men who made them and the men who operate them. But even more than that—it's an all-out, exhaustive test once and for all—of Warner & Swasey stamina and built-in extra capacity. In war, its result has been more vital material—in peace, it will mean greater production at lower unit cost—lower upkeep—less time out for repair—all vital factors in helping you to meet competitive costs and postwar production schedules.

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TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINES

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More Than Lip Service

V-E DAY may be proclaimed anytime. It may happen before you read this editorial, or it may be postponed a matter of weeks.

Upon one point, however, everyone agrees. V-E Day is definitely in sight. The chances are that it may be upon us before we realize it. We expect it, yet it still will come as a surprise and a shock.

That date will mark an end of one phase of the war and the beginning of another. Instead of fighting two wars, we henceforth shall be fighting one war.

Even our military officials admit that it won't take the same volume of production to carry on against Japan as it did to battle both Germany and Japan.

Prospects are for a cutback of 12 percent in war production in the first 90 days following the fall of the Nazis, and for more substantial slashes in the succeeding quarters.

At the same time that we fight on to a conclusive victory in the Far East, we shall be trying to put into effect at home plans for keeping all of our people employed and for giving jobs without delay to our soldiers, sailors and marines as they are discharged from the services (and don't overlook the fact that some 1,250,000 have already returned to civilian life).

The immediate problem that will face us right after V-E Day, excluding the all-important task of whipping Japan, will be the reconversion of our manufacturing facilities no longer wanted for war purposes back to the production of civilian goods.

The highest circles in Washington are eager to see that transition take place with the least possible delay and with the greatest possible ease. Any prolonged layoffs of great magnitude will be a most disturbing influence, economically and psychologically. They must be avoided.

That brings us up against the essentiality of getting under way at the earliest moment the building of productive machines without which reconversion will inevitably be slowed down.

In the early days of the war the country awoke to the critical necessity of providing the machine tools needed for the making of guns and planes and tanks and bombs. At that time the machine tool industry was called a bottleneck.

Though complex machine tools were turned out at a rate many times that ever before required, it took time to get them and then to install them exactly in the spots where they were most needed.

Unless Washington moves rapidly in the immediate future—and it doesn't show signs of being conscious of the danger—we shall be in the same relative position with regard to reconversion that we were in getting started in the manufacture of war products.

You don't make machine tools and put them on the shelf ready to be used when wanted. You can't build them overnight. The larger ones in particular take weeks and sometimes months to produce.

That is the reason why the proper authorities in Washington must not procrastinate unless they are willing to assume the blame for creating, without fault of the machine tool industry itself, another machine tool bottleneck in the reconversion program.

General Motors, for one, must replace 3,000 vital machine tools before it can hope to make a noticeable dent in civilian goods manufacture. Those machines have gone into the war effort and, for various reasons, have disappeared for good from the corporation's assets. So long as any considerable number of these 3,000 machines are missing from its production lines, General Motors is crippled in resuming peacetime operations. This example can be multiplied many times.

For Washington to encourage machine tool builders to begin to make critical machines for civilian production on a regularized, fully accredited basis, while nowise interfering with their wartime obligations, would be an act of great wisdom.

That action alone will do more than anything else to prove to the country that Washington is giving more than lip service when it tells the country that it is shaping up a reconversion program adequate to meet the nation's needs after organized resistance in Germany ceases.

Burnham Finney

MORRIS MOR-SPEED
Vertical Production Machine

● This Morris high production machine was designed to meet the particular requirements of the job. The machine performs several operations on each piece without resetting.

It has a 3 H. P. vertical hydraulic feed with 8 station automatic indexing table—two side milling heads with rack feed—also an additional unit for chamfering end of half piston. Permanent bushing plate and milling heads are supported on the platen.

Push button control simplifies operation. A separate tank with individual pump assures ample coolant on all operations. When you have a job requiring high production equipment consult Morris. They have the engineering skill—manufacturing facilities—and experience necessary to produce highly specialized machines capable of high production and low costs.

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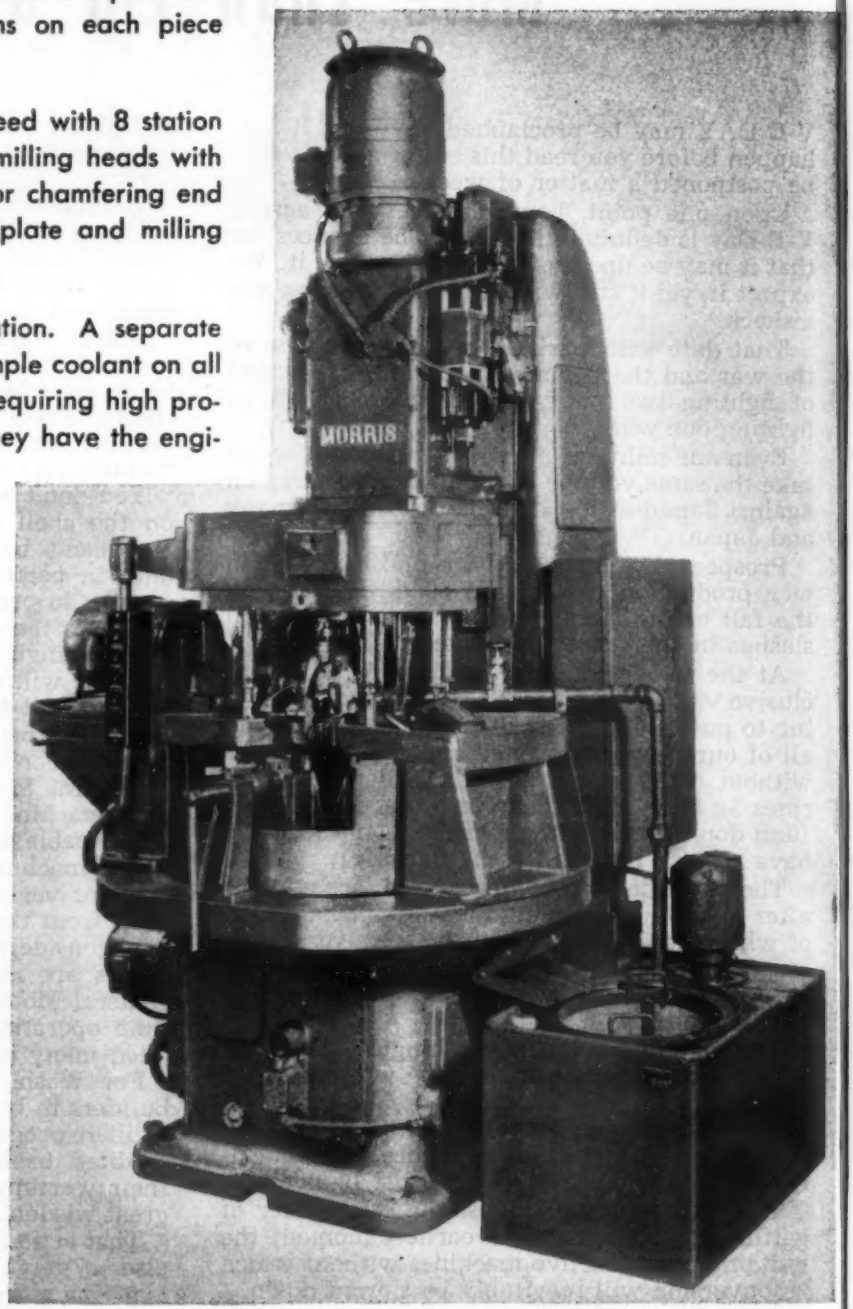

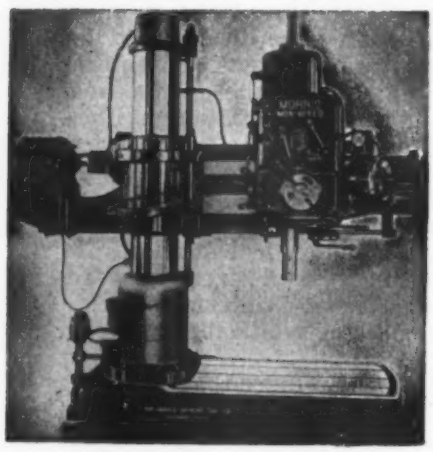

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The MORRIS Machine Tool Co.
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New Technique in Gage Control Raises Efficiency, Cuts Costs

BY E. B. SARREALS, KOLLSMAN INSTRUMENT DIVISION, SQUARE D COMPANY

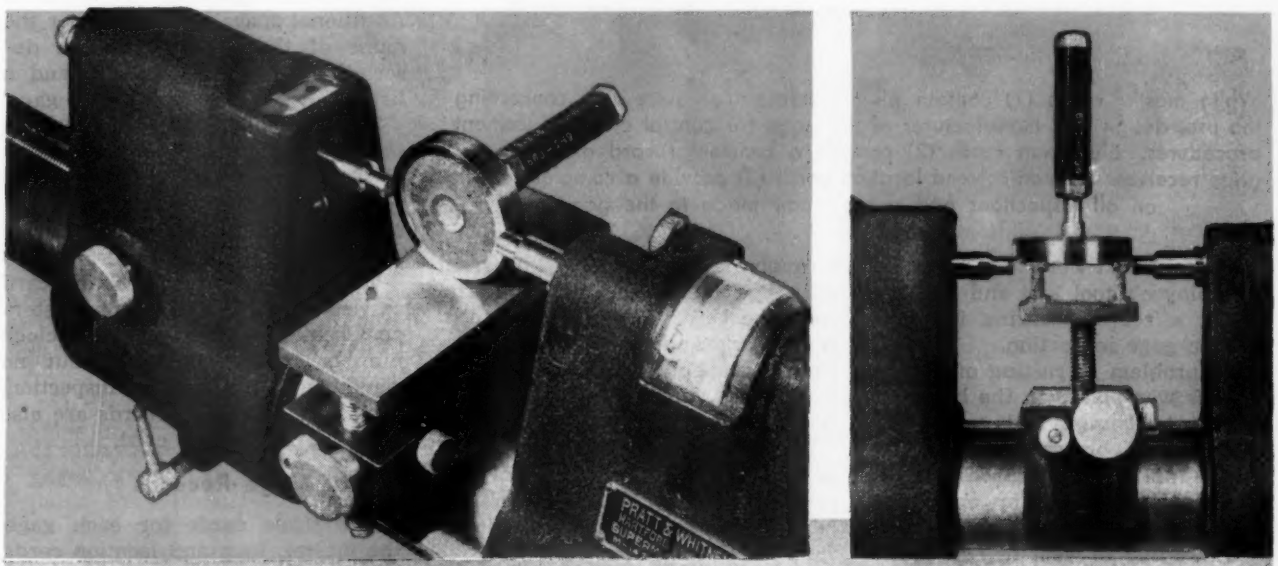
A case history of an efficient gage control system proves that properly planned controls can improve production efficiency and raise inspection quality

THE WAR'S DEMAND for absolute precision in production made rigid inspection procedures a "must." Implementing it made necessary the purchase and maintenance of more and more gages until their mounting costs centered attention upon gage use, preservation and control.

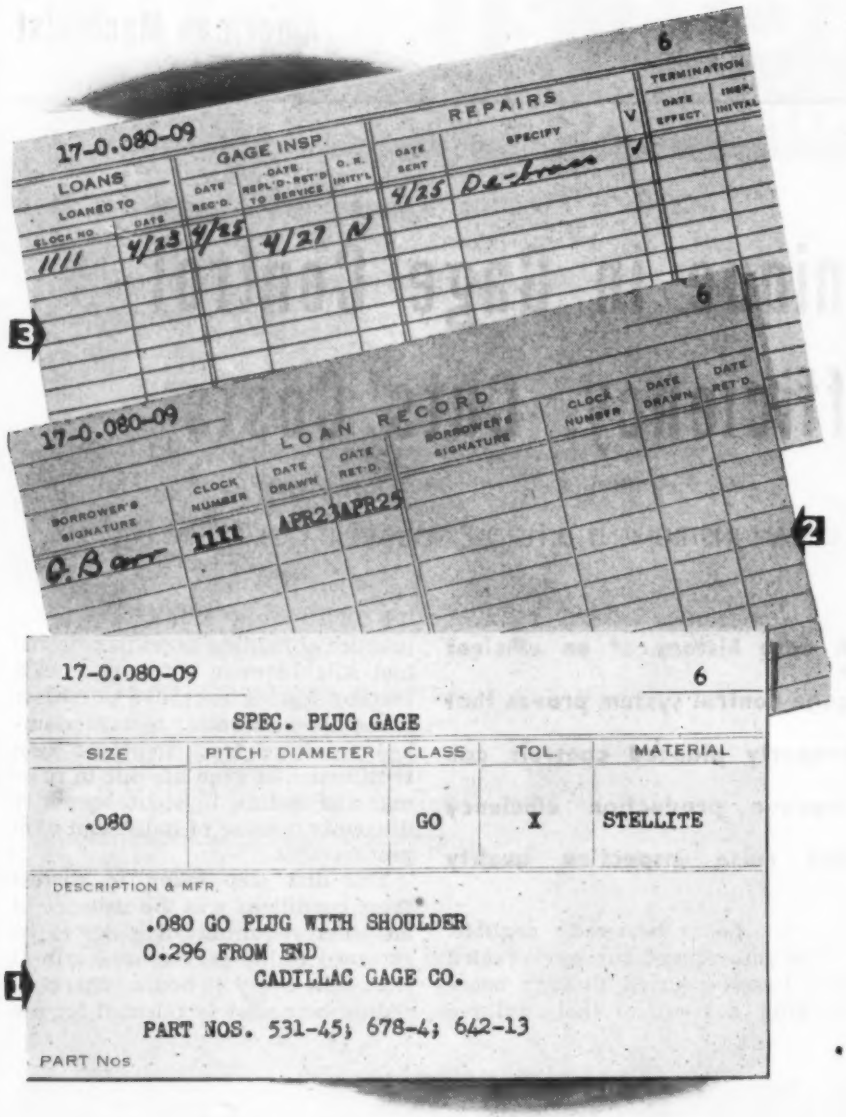
This situation moved the Kollsman Instrument Division of the Square D Company to analyze the gage control system it had instituted when the demand for flight control instruments was relatively small and gage losses were sufficiently small as to be considered neglible.

The subsequent survey revealed that losses occurred through overstocking, a result of the employee practice of holding gages in personal tool kits between infrequent uses, thereby forcing excessive purchases to maintain a working reserve; damage resulting from improper use; termination of gage life due to rusting; and failure to secure quantity discounts because of individual item procurement.

The first step taken to correct these conditions was the issuance of an order requiring all gages to be returned to the gage control crib at least once every 48 hours. This procedure immediately released for use



The correct set-up for measuring the diameter of a plug gage has the cylindrical surface of the gage resting on the table. In this position, the gage may be rocked from side to side until the correct reading is shown on the instrument. When the gage is made to rest with its face parallel to the table, the readings obtained may be over the true dimension if the face of the gage is not square with the cylindrical surface of the gage



White master cards (1) contain all the information necessary concerning the use, design and manufacturer of the gage for control and replacement procedures. Blue loan cards (2) provide a constant record of the use a gage receives. Salmon-colored location cards (3) provide a complete check on all inspections and every repair made to the gage

many gages that were formerly kept in employee's tool kits and had the further effect of insuring frequent periodic gage inspection.

The problem of rusting of gaging surfaces was placed in the hands of the plant chemist and solved by means of debrassing baths and chrome plating of surfaces to reduce damage caused by acids deposited in handling. Gages below tolerance due to wear or rust losses were reclaimed by chrome plating and lapping to size.

It was found that damage caused by improper use of gages was due to a lack of understanding, by the employees, of the proper use of the gage and the probable result of its misuse. This condition was attacked through an educational program utilizing lectures, technical material from the University of the State of New York and photographs illustrating proper methods of gage use to foremen, inspectors and production workers.

The order requiring the return of gages after 48 hours raised its own problem of delay in the transfer of gage records under the old triplicate system. A check showed excessive time consumed in making out slips, locating the gage, and again on return when the files were searched for the carbon filed under the employee's clock number and the original filed under the number of the gage. After several methods of keeping gage records were considered, the following procedure was adopted as the most efficient.

All gage drawers were numbered and the gage size and type indicated to facilitate speedy location. From existing gage records, all gages were segregated by size and type and a control number formulated to identify each individual gage.

Code Identification

Utilizing this code, plain plug gages, as an example, are given the designation "10"; plain plugs with special features are indicated by adding the figure "7" to the type number, forming series "17." To these type numerals the figures indicating the size of each gage are joined. For instance, a plain plug gage with special features intended to gage 0.080 in. carries the number -17-0.080. The serial number of gages within the type and size is added to this stem. Thus, if ten gages, 0.080 in type "17" are stocked, the controlling codes will run 17-0.080-01 to 17-0.080-10. Thread ring, thread plug gages and other measuring devices also were given specific designations, which were stamped on the handle of each. As an extra precaution the identifying number was burned into each gage with an electric pencil.

All gages were registered in a color-coded card index. A white master card for each gage carries its complete description, control number, type, size, class, tolerance, and the material of which it is made. Additional space is provided for the name of the manufacturer, a description of special features and a listing of parts checked by the gage.

The blue loan control card carries the control number and the location of the gage at the top and provides space for the borrower's signature, clock number, and dates of issuance and return.

The salmon-colored location card carries the control number and storage location of the gage; the clock number of the borrower but no signature space. Gage inspection, repair and disposal records are also provided for on this card.

Use of Gage Records

The three cards for each gage, the master, loan and location cards, are placed in sets in numerical order in a tub file, with numerical guides inserted every 21 cards. The last file space to the right in the tub file is utilized as an "out" file and is provided with sections for inspection and production departments using gages; Drill Press; Experimen-

cal; Lathes; Finished Parts and others as necessary. To establish the 48-hour time control on gages issued, each departmental space is further subdivided by guides for each day of the week. Thus, all gages subject to recall on a given day are automatically grouped.

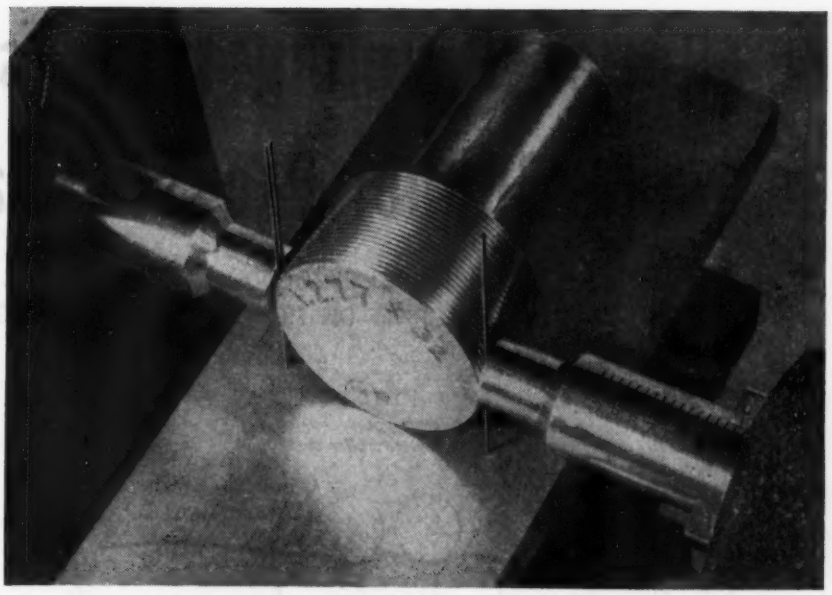
When a gage is requested, its size and type are specified. This information automatically indicates the control number of the gage. The blue and salmon cards are removed from the file for the gage requested and the gage drawn from its location. The employee signs the blue loan card, the date of withdrawal is stamped and the card is filed under his clock number. The salmon location card is placed in the "out" file in the division for the department in which the employee works and under the day of the week the withdrawal is made.

No delay is entailed in returning gages. An employee gives his clock number and the gage control number. The blue loan card is removed from the clock number file, stamped with the date of return and refiled with the master card. This clears the employee's record.

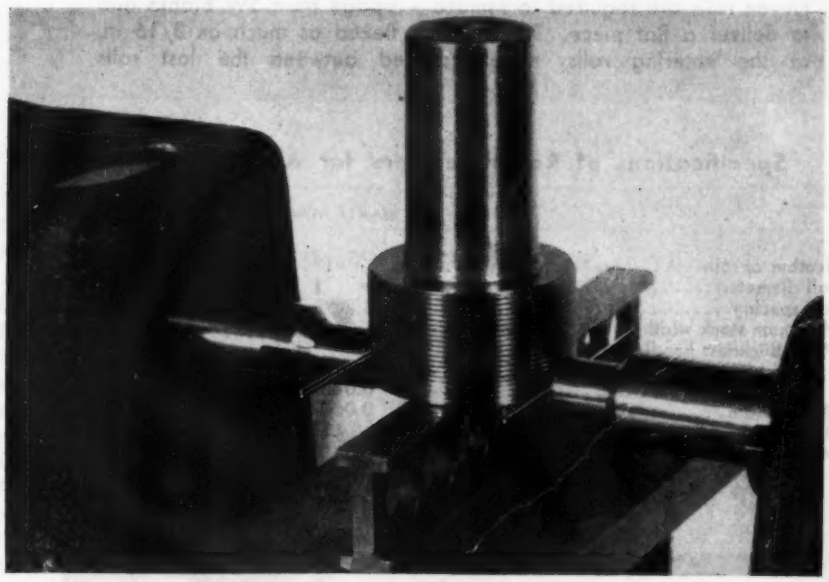
The location card is withdrawn from the departmental division of the "out" file, the date of return is stamped and the card is then moved with the gage to the gage inspectors.

If the gage is found to be in good condition the inspector initials the location card and stamps the date of the gage's return to service under the appropriate caption. The card is returned to the file behind the master card and the gage returned to storage.

Should the gage require lapping, de-brassing, plating or other repair, the name of the vendor or department rendering this service is entered on the location card which is placed in the "out" file under "Repair" until the gage is returned. This completes the routine.



A thread gage should be set up in the same manner as the plug gage. Two of the wires should be in opposing threads and the third should be advanced one thread. The wires should be equally tight



If it is necessary to measure a thread gage while it rests in a horizontal position, a narrow support should be used and the gage adjusted until the three wires are equally tight

Estimating Purchases

A periodic survey of the location cards reveals the frequency of use of individual gages and of groups of gages of specific types and all repairs. From these facts, it is possible to predict probable gage life with reasonable accuracy and determine future reserve and replacement requirements. This permits placing of purchase orders to be done on a quantity basis rather than a spot replacement basis. The quantity discounts on gage purchases will no longer be lost.

The entire system is simple to install, requiring no special equipment other than a multi-wheel hand stamp for numbering the cards and a librarian's pencil-top date stamp for registering dates of issue and return. Installation at Kollsman was done without interruption of service.

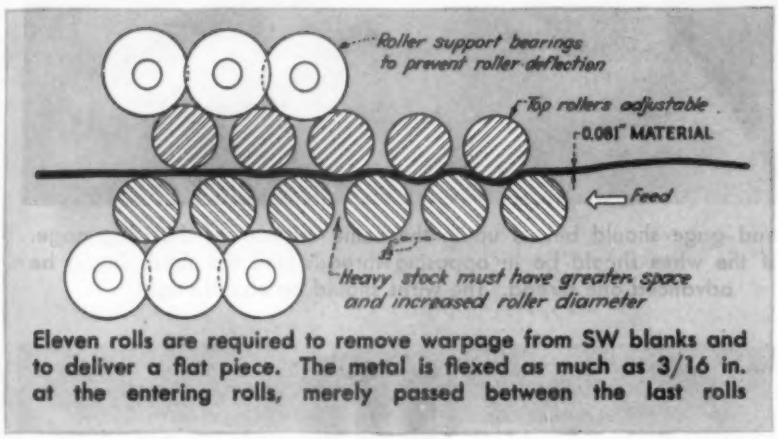
A set of loan and location cards will last for a minimum of three months. To prepare replacement cards it is necessary only to stamp the index number of the old card on the new. The master card is never replaced and remains active for the life of the gage.

This system has proved economical in time and cost and effective in control. The amount saved directly by its use far outweighs the small cost of initial installation and the indirect savings are much greater than the apparent saving.

The course of instruction on gage use materially aided in extending equipment life. Although, with the gage control system, a smaller number of gages supplied increased requirements, the necessary replacements were less than those required when a larger number of gages received relatively little use but were not properly handled.

Roller Leveling Increases Output In Rubber-Press Department

BY FRANK KUBICHEK, PRODUCTION ENGINEER, LINDEN PLANT
EASTERN AIRCRAFT DIVISION, GENERAL MOTORS CORPORATION


Roller support bearings to prevent roller deflection
Top rollers adjustable
0.081" MATERIAL
Feed
Heavy stock must have greater space and increased roller diameter

Eleven rolls are required to remove warpage from SW blanks and to deliver a flat piece. The metal is flexed as much as 3/16 in. at the entering rolls, merely passed between the last rolls

Most of the trouble arising from warpage of aircraft parts formed in rubber tooling can be avoided by heat-treating the blanks and then flattening them by machine

ROLLER LEVELING has proved successful in lowering the cost and increasing production of aircraft parts formed by the rubber-die method. Most aluminum sheet-metal parts are blanked, formed and heat-treated. Warpage that occurs during heat-treatment must be removed before the part is finished. If the parts are formed first and then heat-treated, the warpage must be removed by hand—it is impossible to use a mechanical device to straighten them. Much less labor is involved if the blank is heat-treated before forming, then rolled flat by machine and finally formed, because with this operational sequence only a few minor corrections need be made by hand to get a perfect part. Experience indicates that savings up to 80 percent can be realized on the most costly part of the total forming process. This occurs when flattened heat-treated blanks are formed on tools corrected for springback and bowing.

Better parts are produced when blanks are heat-treated to the SW condition and then roller leveled. The metal is flat and free from dents and nicks made by hammer finishing. The parts will withstand higher compression loads without buckling and give better results on fatigue tests. Greater accuracy is also secured because the formed pieces need little hand finishing.

Our application of the roller leveling process to aircraft work came about as part of a program to get twice the previous production out of a Hydro Press. The "rubber-press" department was efficiently laid out around two machines, but we were forced by war requirements to surrender one press to another manufacturer.

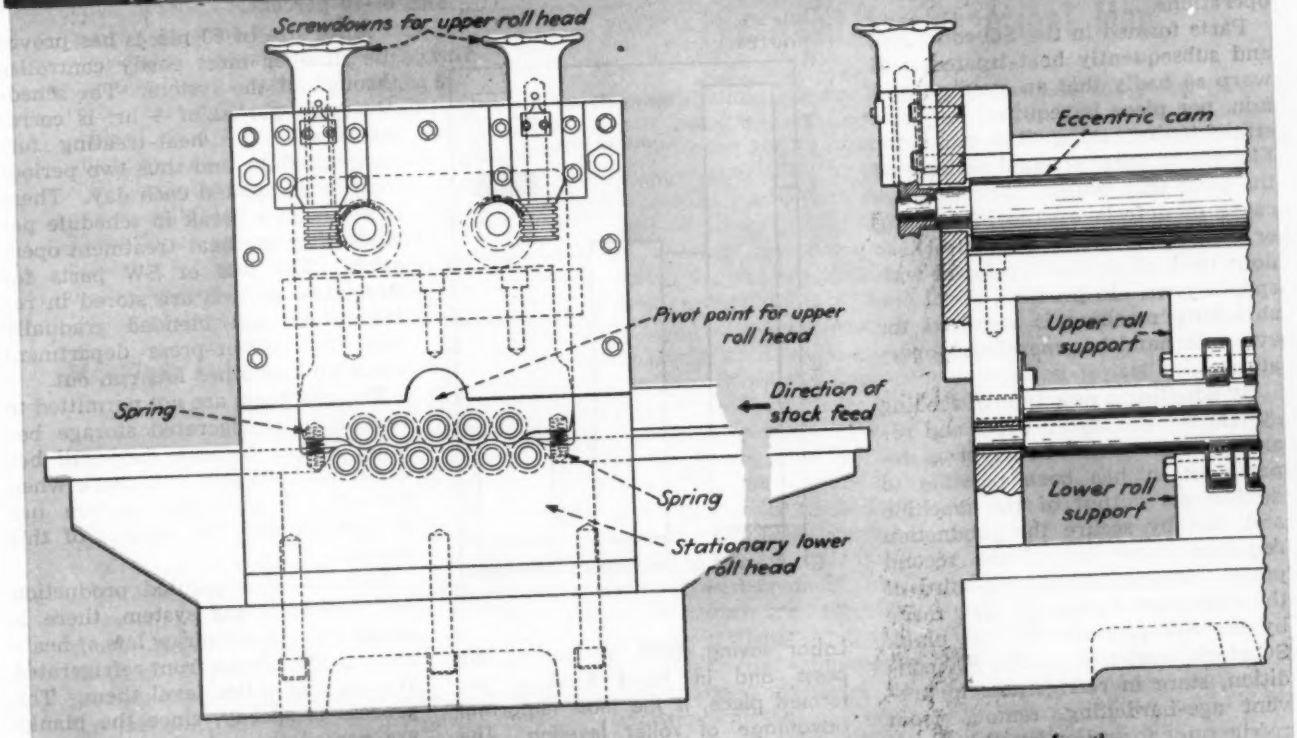
We use the rubber press because of its

Specifications of Roller Levelers for Aircraft Work

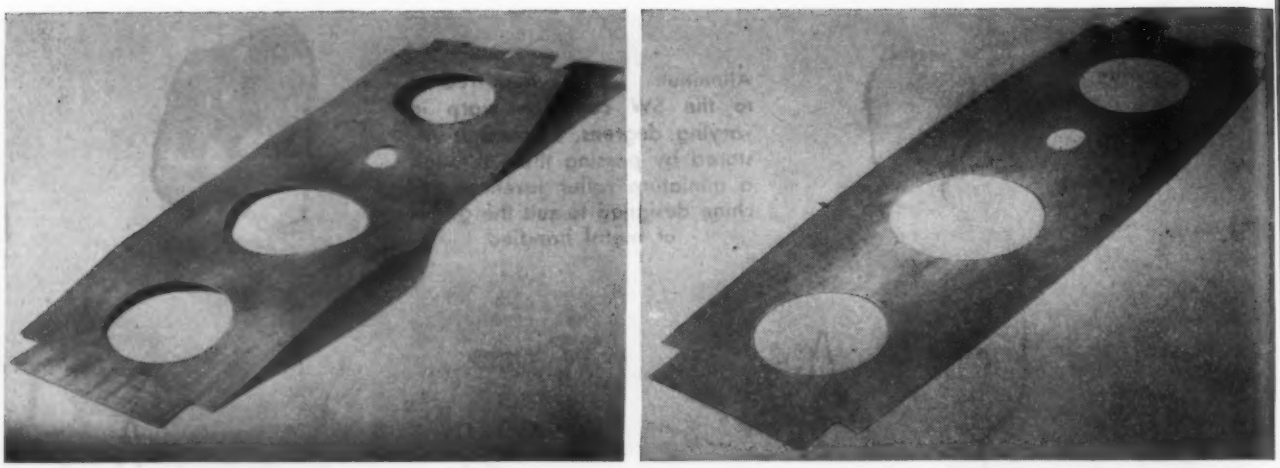
	SMALL MACHINE	LARGE MACHINE
Number of rolls	11	11
Roll diameter	1	1¼
Roll spacing		
Maximum stock width, in.	16½	22½
Metal thickness handled:		
Full width	0.020-0.040	0.025-0.062
Half width	0.040-0.060	0.062-0.081
12-in width	0.060-0.125	0.081-0.187
Stock speed, s.f.m.	130	90
Motor hp	3	4

If parts are formed in the SO condition and then heat-treated, they will warp and can not be straightened by machine. At least 5 min. on the average is then required for hammer finishing

Aluminum blanks heat-treated to the SW condition warp in varying degrees. Flatness is restored by passing them through a miniature roller leveling machine designed to suit the gages of metal handled



Feature of the roller leveler designed at Linden is a screw down arrangement for the upper roll head to permit tilting. Thus, the entering rolls are "meshed" so that the blank is flexed considerably in the initial stages



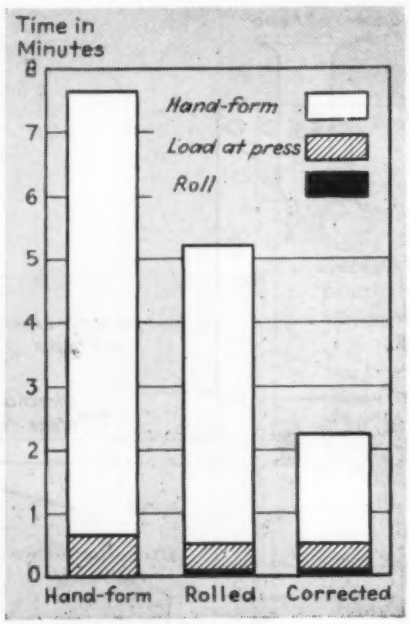
Only minor corrections need be made in the formed part if it is heat-treated first, as at left, rolled flat by machine as at right and then formed. Furthermore, the metal is free of dents or nicks produced by hammer forming, and there is less susceptibility to buckling and fatigue failure in service

advantages for small-lot runs of a number of different parts. It is common for us to produce from 50 to 75 pieces of each of 120 different parts during a shift. This allows a smooth flow of material and a relatively small inventory. Under these conditions the negligible set-up time for rubber-press tooling and the low cost thereof are decided advantages. But although costs of tooling, set-up and direct labor in the forming operation itself are low, the rubber-die method has proved somewhat expensive in regard to subsequent operations.

Parts formed in the SO condition, and subsequently heat-treated, will warp so badly that an average of 5 min. per piece is required for hand straightening, using fiber hammers. Flanges or other straight sections of the piece may require shrinking because of defects arising in forming or heat-treatment. Such work is done on kick presses equipped with special jaws. In practice, about one shrinking machine is required for every 15 hand hammer-finish operators.

By adopting a new type of feeding system for the Hydro Press and rearrangement of the rubber-press department, it has been possible to double the output of the machine and thereby secure the production required since loss of the second press. Approximately one-third of the sheet-metal parts are now made by the SW process—that is: blank SO stock, heat-treat to the SW condition, store in refrigerator to prevent age-hardening, remove from refrigerator for roller leveling (usually 50 pieces at a time), return to refrigerator at point near rubber-press conveyor. When placed on form blocks on a conveyor, the SW blanks proceed to the press, are formed, then unloaded in the hammer form area. After hammer forming, the pieces are put on a slat conveyor for movement to the inspection area. The balance of the parts are formed in the SO condition, heat-treated, placed in the refrigerator until they can be finish formed by hand.

In the operation of a rubber-press department there should be a relatively uniform flow of material, and also uniformity as to part area, type of part and work requirements. That is, the total form block area of parts to be run each day should be nearly constant. Thus, there must be a consistent daily ratio between the number of SO and SW parts, and the total amount of work required to load, unload and hammer the specific pieces. Advance planning enables the department to operate at the high efficiency level of 70 percent.



Labor saving, both in loading the press and in hand finishing the formed piece, is the most important advantage of roller leveling. The chart shows that hand forming time is reduced approximately 75 percent when the form tools are corrected for springback and bowing

A lot size of 50 pieces has proved the number most easily controlled throughout the system. The schedule cycle period of 4 hr. is correlated with the heat-treating furnace schedule, and thus two periods may be completed each day. There is no distinct break in schedule periods after the heat-treatment operation. The lots of SW parts for successive periods are stored in refrigerators and blended gradually into the rubber-press department operations as other lots run out.

The SW parts are not permitted to remain in refrigerated storage beyond 24 hr., because they will become too hard and will crack when formed. A color-tag system has proved an effective control of this matter.

Because of scheduled production and the color-tag system, there is ample time to withdraw lots of heat-treated SW blanks from refrigerated storage and roller level them. The process is speedy, since the blanks are passed through the machine at from 90 to 130 surface feet per min., depending on the machine used. Flattened blanks are then immediately used at the rubber-press or re-

turned to refrigerated storage until needed.

The roller leveling machines used are an adaptation of a well-known type of equipment. Eleven small-diameter rolls, closely spaced, are required to flatten the piece. Six of these rolls are mounted in the lower roll holder, which has no adjustment. The remaining five rollers are supported in bearings in the upper roll head, which is adjustable. The upper roll head can be moved up and down within the housing and tilted by proper operation of two screwdowns.

Each of these screws, or worms, turns a wormwheel attached to an eccentric cam roller. The cam roller extends completely across the machine and bears against a bearing-metal strip fastened to the top of the upper roll head. If one screw is turned more than the other, the roll head will pivot in the housing, and thus close the rolls closer together, preferably at the stock-feeding side of the machine. In practice, the rolls at the feeding side are "meshed" whereas those on the delivery side merely exert slight pressure on the emerging stamping to impart the final straightening action.

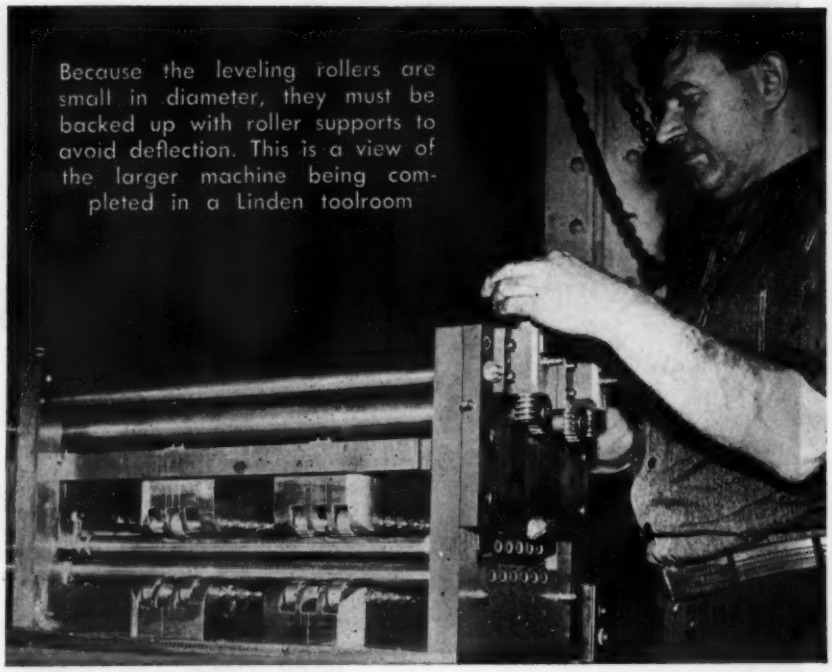
In operation, the metal stamping enters the "meshed" side of the rolls, and is bent backward and forward as it moves through the machine. This flexing action releases thermal stresses in the metal, and decreases in severity with each roll traversed, until at the last stages the rolls exert only enough pressure to achieve final flatness. Eleven rolls must be used when straightening SW aluminum, or even soft steel, in gages suitable for aircraft work. There is no appreciable increase in hardness of the metal as a result of the working received during the rolling process.

Machines Built in Two Sizes

One roller leveling machine will not handle all gages of sheet metal used in airframe construction. The diameter of the rolls and their spacing are reduced in proportion to metal thickness. For this reason two machines have been built. One is intended for 0.040 in. stock, the other for 0.081 in. metal, but of course both machines will handle thinner or thicker gages. If the gage exceeds the nominal rating of the machine, the piece width must be in proportion to the unit's full-width capacity. Thus a great variety of parts can be roller leveled.

The roller-leveling operation is especially fast. For many pieces from 20 to 30 per minute can be passed through the machine with ease. Time studies show an average of ten pieces per minute for all parts handled in the SW condition.

But the greatest importance of the roller leveling machine lies in its ability to increase production in the rubber-press department. Because of the great reduction in time spent on hand finishing SW parts, the average number of pieces produced per manhour has showed an increase of greater than 30 percent.



Because the leveling rollers are small in diameter, they must be backed up with roller supports to avoid deflection. This is a view of the larger machine being completed in a Linden toolroom

The Need for Practical Men

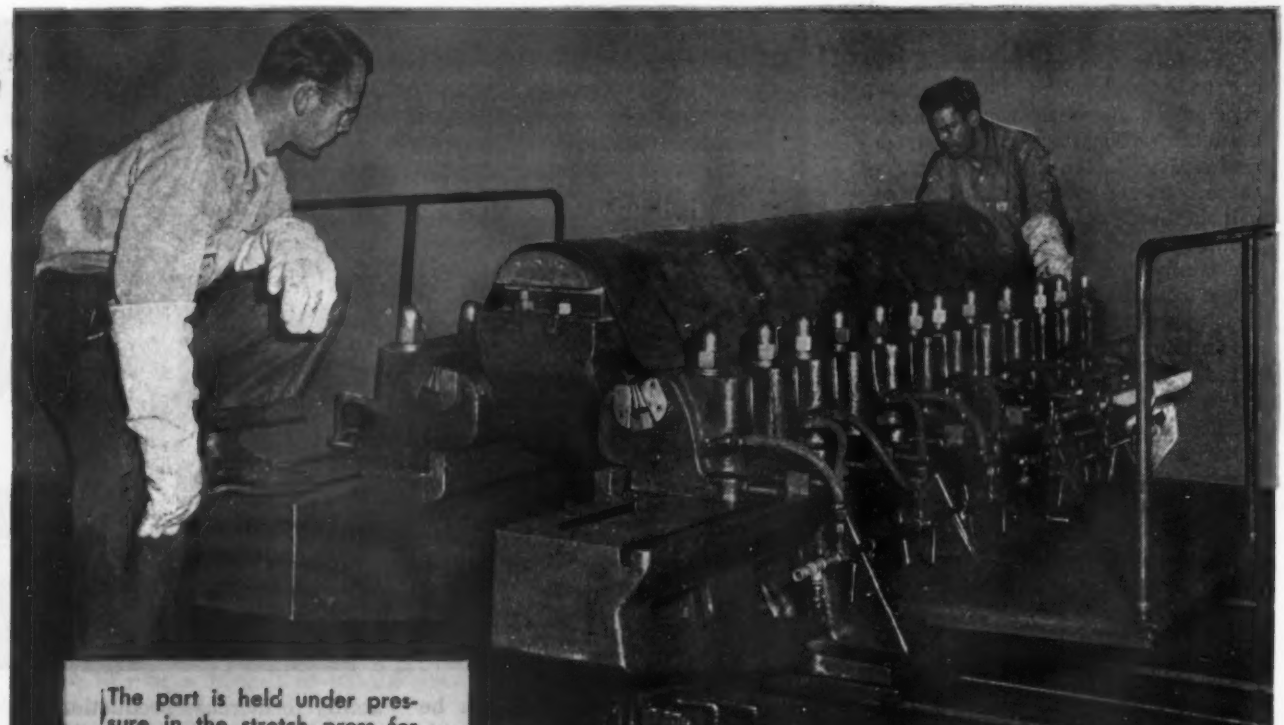
ONE OF THE outstanding features that has made our huge war production possible has been the ability of shop men with wide experience to produce badly needed parts with machine equipment already available. Instead of waiting for machines specially suited for the work, hundreds of small shops have turned out parts while the idealists waited for machines to be built.

One particular example is that of a small shop on the West Coast engaged in turning out propeller shafts for the ships coming out of the Kaiser yards. Old lathes were revamped with headstocks welded of plate steel and fitted with substantial babbitt bearings. Feed mechanisms were rigged using old automobile transmissions for securing necessary changes. Using such improvised equipment this shop began turning out shafting as soon as needed and its production has kept pace with the demand of the shipyard.

In contrast with this, a large production shop held up delivery of vital airplane parts for 90 days while they waited for some large boring machines. The work could have been handled equally well by much less expensive drilling machines that were already in the shop.

Much has been gained by calling over-age mechanics back into the shop so that their wide experience can be utilized on the new work that is coming in every day. But this backlog of experience cannot be counted on to last into the postwar years where it will be needed as much as at present. For one of our great problems is going to involve securing efficient tooling both to produce great quantities of material and to keep the prices down so that markets can be widened.

Managers in shops of all kinds are urged to consider carefully all methods of securing a supply of men with experience as instructors of younger men who must succeed them in a few years. While more and more automatic machines are bound to come and will help in reducing machining costs, these can never take the place of practical men to plan the work and provide tools for it.



The part is held under pressure in the stretch press for seven seconds after full closure to insure permanent set in the material

Use of Sheet Magnesium Alloys Expanded by Hot-Forming Method

BY PAUL HAWLEY, PROCESS ENGINEER, NORTHROP AIRCRAFT, INC.

MAGNESIUM ALLOYS at the present time are used primarily as forgings, castings and extrusions. However, with the successful contour forming of sheet magnesium alloys, wider use of these alloys is possible. In designs where the combination of lightness and rigidity of structure is to be desired, magnesium alloys may be formed to any shape possible with aluminum, provided the forming is done at elevated temperatures.

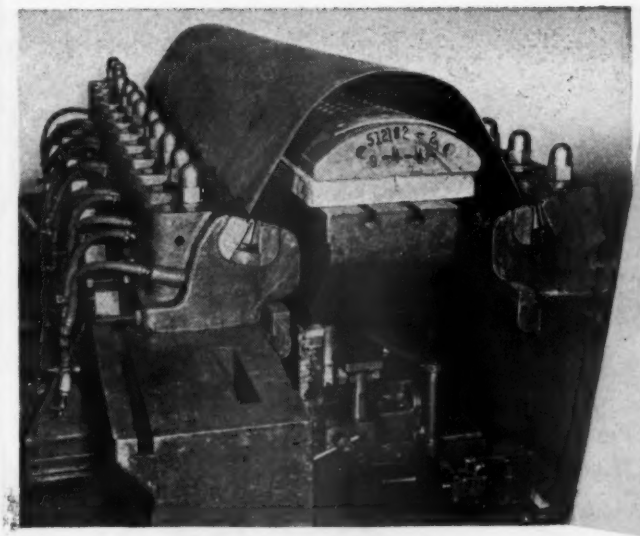
By the use of hot-forming, where cold-forming was formerly employed in the fabrication of the P-61 magnesium spoiler, Northrop Aircraft has realized a saving of $41,433.03 in material and labor alone. This saving is based on 767 sets of production spoilers and 109 sets of spares, totaling 3,504 magnesium parts.

Heated dies assist in solving the problem of contour forming spoilers from magnesium alloys

The cold-forming method, using the press brake and standard V-dies, required two manhours per part, as well as one stress-relieving operation, plus a twenty percent rejection due to breakage. The resulting spoiler blank was inferior both in contour and physical properties.

The hot-forming method, using the stretch press and a heated Zamac die, requires six man-minutes per part with no rejection due to breakage or other causes. All cutting, drilling and finishing is completed prior to the forming operation. This reduces the manhours and tooling required in making the spoiler blank because all operations are performed on the flat plate. The spoiler plates formed cold required all cutting to size, drilling and finishing to be completed after the flat plate had been broken to the required contour, thus requiring elaborate, special tooling.

Magnesium must be formed hot because of the hexagonal lattice grain structure. When formed cold the slippage occurs along one plane, parallel to the basal plane only. When formed at elevated temperatures, slippage will occur not only parallel to the basal plane but along the pyramidal planes thereby resulting in proper forming without rupture of the grain structure.



Cost Comparison of Forming Methods

COLD-FORMING	
Weight of 3,504 accepted parts (0.250 × 27.0 × 91.0)	137,496.96 lb.
Weight of 701 rejected parts	22,507.24 lb.
Cost per lb.	$ 0.575
Total material cost	$ 92,002
Manhours—8,410 at $2.50 per hr.	$ 21,025
Total material and labor cost	$113,027
HOT-FORMING	
Weight of 3,504 accepted parts (0.250 × 24.0 × 91.0)	122,990.40 lb.
Cost per lb.	$ 0.575
Total material cost	$ 70,719
Manhours—350 at $2.50 per hr.	$ 875
Total material and labor cost	$ 71,594
SUMMARY	
Cold-forming cost	$113,027
Hot-forming cost	$ 71,594
Direct saving by hot-forming	$ 41,433

With all machining operations completed while the sheet is in the flat, a magnesium alloy spoiler is placed on the electrically heated die and formed by pressing against the mild steel strap

After forming, the parts are placed on a flat to cool. They cannot be nested to cool as this would increase the creep-back that occurs in cooling and result in warpage

Hot-forming is applicable to both magnesium and aluminum alloys. The hot-forming of light alloys has been investigated by the National Research Defense Council and their results clearly indicate the commercial value of employing controlled elevated temperatures, 200 F. to 450 F., for hot-forming of magnesium and aluminum alloys. Each alloy has its own forming temperature consistent with the end shape of the part and the physical requirements.

It is imperative that close control of the forming temperature be maintained as prolonged heating of the material at the forming temperature will reduce the physical properties.

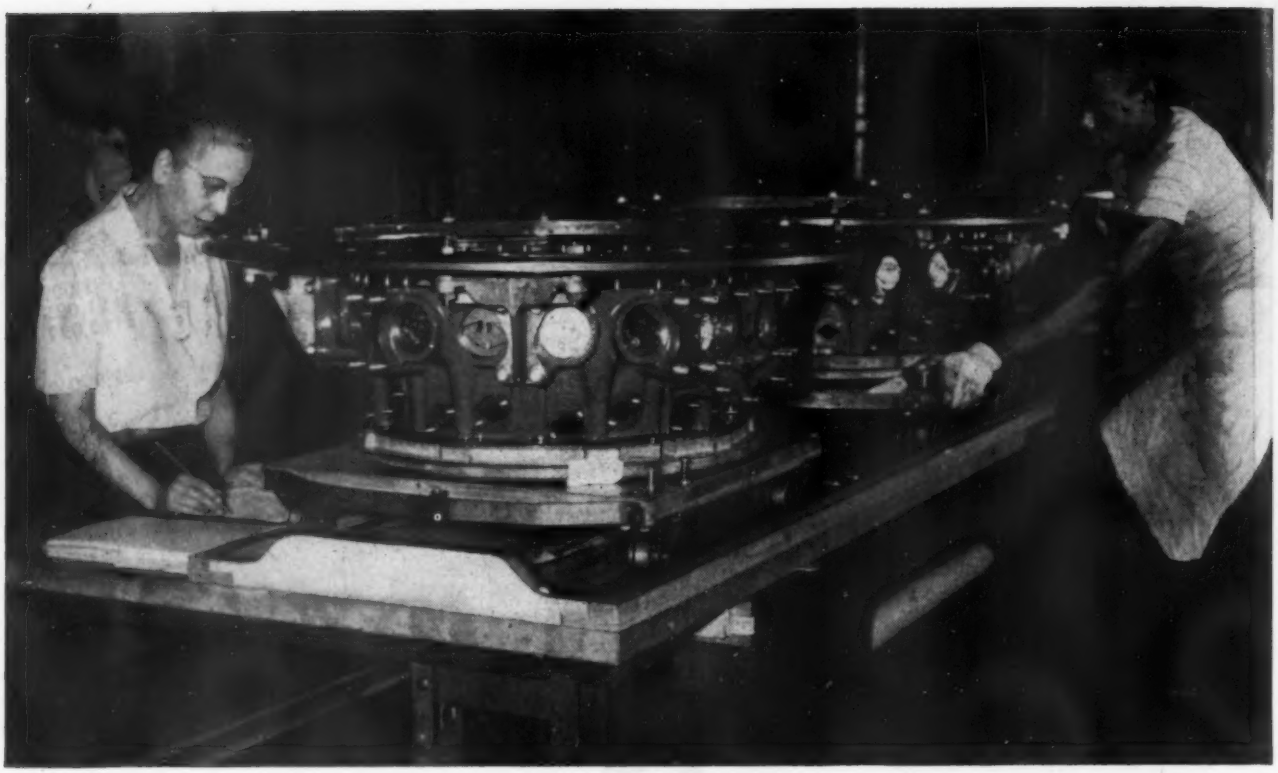
The stretch press method was developed when excessive manhours and material were expended in cold-forming a quarter-inch magnesium alloy plate with a tensile strength of 40,000 lb. per sq.in. to approximately a 14-in. radius. This hot-forming method employs a heated Zamac male die and a mild steel strap, drawn to the contour of the die, held in the stretch press jaws. The heated die is insulated from the stretch press ram by a 4-in. maple block and ¼-in. asbestos sheet.

The temperature of the die is thermostatically controlled at 450 F. The electric heating elements are installed in Shelby tubing cast in the die. The die was developed to over form the spoiler plate to give a true contour when cold. Spring back occurs when the press is opened and creep back during the cooling time.

Completed parts, after cooling, have the proper contour throughout the length without lateral distortion

It is imperative that each plate be allowed to cool on a flat bench so that outside forces do not affect the contour of the plate. The plates should not be nested during storage as the weight of the parts may affect the contour. The forming operation requires three men; one to operate the press and two men to load and unload the press. The blanks are preheated in a hot air furnace to 425 F. for approximately twenty minutes.

A cold blank is put in the oven and a hot one removed and placed on the die. The press is closed and held for seven seconds, opened and the spoiler blank removed to the cooling bench. The operating cycle is two minutes.



Each of the major subassembly lines consists of a long wood workbench equipped with tracks which guide castered wood dollies designed to suit the subassembly. The work is moved from station to station along the bench until ready for final inspection and delivery to the final assembly line. The supercharger front sections shown are ready for assembly on radial aircraft engines for the B-29 and B-32 bombers

Subassembly Roller Dollies Provide Quick Transportation

The problem of moving engine subassemblies from bench to bench for inspection, run-in and re-assembly is solved by simple four-wheeled dollies

AUTOMOBILE-TYPE ASSEMBLY methods have been adapted to the manufacture of 18-cylinder Wright Cyclone 2,200 hp. radial aircraft engines for Boeing B-29 bombers in the Dodge Chicago Plant of the Chrysler Corporation. The final assembly department at this plant consists, essentially, of three separate lines. One of these is devoted to the assembly of engines for the "green" first test run, the second is used for tearing down these engines for inspection, while the third is used for reassembly of the engines for the final power test run. The first and third lines are the same, as the same operations must be performed during the original assembly of the engine and during its reassembly after inspection.

In each case subassembly lines feed major subassemblies to the final assembly line at the points where they are to be joined to the engine. Usually, the lines consist of wood work benches of convenient height along which the subassemblies are moved from operation to operation until completed.

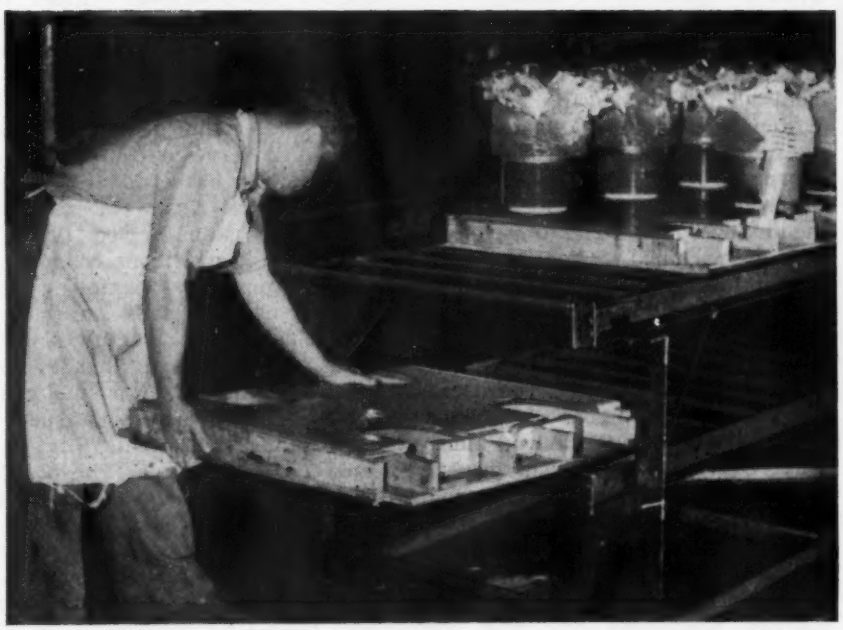
The length of each subassembly bench is determined by the number of operations to be performed and the amount of space required for each of the operations. To eliminate damage to the parts which might be caused by moving them along the work bench, and to position the work conveniently for the workers, each work bench is provided with a series of plywood dollies, specially designed for the subassembly with which they are to be used. Most of the dollies are equipped with four fixed casters which run in tracks on the top surface of the work bench. This arrangement makes it easy to move the dollies from one position to the next along the bench and insures against the dolly being pushed off the bench accidentally. The dol-

Dollies for pistons each hold nine units, enough for one bank of the 18-cylinder engine. Plywood separators keep the units apart to protect the finely finished surfaces from damage

When the pistons have been removed, the dolly is moved by hand from the top of the bench to an inclined track under the bench for return to its starting point. Fixed steel casters under each dolly provide for easy movement along the bench

lies usually hold one assembly each. However, multiple-position dollies are used for pistons and cylinder assemblies. Dollies for pistons have nine positions so that enough pistons can be mounted for one bank of the engine. Dollies for cylinder assemblies are flat-bottom plywood units which are moved on a bench made of a roller conveyor section. These units hold four cylinder assemblies each.

Underneath the subassembly benches is an inclined track on which the empty dollies are returned to the starting end of the bench after the finished units have been removed for assembly on the engine. The dollies are light in weight and easily handled from the top of the bench to the return track by hand.



Plywood dollies for cylinder assemblies each hold four units. These units are flat-bottomed, are moved on roller conveyor assembly benches and on return runs of inclined roller conveyor

Simple, Inexpensive Tools PRODUCE Fragmentation Bombs

Automatic chucking machines are equipped with a special tapping spindle and work-holding fixture for operations on the bomb head

Standard stove drawer rollers assembled to lengths of angle iron form the conveyors which move fragmentation bomb coils from the lug welder to the overhead chain conveyor. At the station shown, each welded lug is pulled with an air cylinder to make sure it is firmly attached to its coil

METAL PARTS assemblies for 23-lb. fragmentation bombs are manufactured in large quantities in a small group set up in the plant of the Quick Meal Division of the American Stove Company using, insofar as possible, equipment formerly employed for the production of domestic gas ranges. The coils, seamless steel tubes, lifting lugs and closing plugs for these bombs are purchased ready for assembly, while the head and base pieces must be machined before assembly. Manufacturing tolerances have relatively broad limits on the parts machined for these bombs, thus simple, inexpensive tools have proved entirely satisfactory.

A wire hanger lug is welded to each of the bomb coils at a rate of about 300 per hour, using a Taylor-Winfield 150-kva. spot welder having a special lower electrode which incorporates an arbor for holding the coil horizontally during the welding operation. The upper electrode is machined to hold the wire lug in proper position. During the welding operation, the arbor supporting the coil is braced by a vertical bar which can be swung away to permit removing the coil from the arbor. Coils upon which lugs have been welded are moved along roller conveyor lines to an inspection bench where the location and height of each lug is checked with gages, and each lug is given a pull test of 250-lb. with a bench-mounted air cylinder. Following these inspection operations, the coils are moved by roller conveyor to a loading position where they are stacked in baskets for transfer to the second floor. The roller conveyors employed for moving these coils are inexpensive units made by fitting standard stove drawer rollers to lengths of angle iron as indicated in one of the accompanying illustrations.

The overhead chain conveyeor which transfers finished coils to the second floor serves a two-fold purpose. It moves basket loads of coils, heads and bases from the machine shop to the assembly floor, and it also carries cleaned coils on special hangers from the cleaning group through a paint dip tank and thence to the final bomb assembly group. Basket loads of coils, heads and bases are removed from the conveyor line by means of a special floor-mounted pneumatic lift operated by a foot valve. The basket is moved off the elevator onto a gravity roller conveyor which carries it to a cleaning group where the entire basket load is dipped in a hot alkali tank and then in a hot water rinse tank.

Baskets of coils go from this cleaning station by roller conveyors to a loading station where a workman loads the coils individually onto hangers suspended from the overhead chain conveyor line. Empty baskets are returned on the same conveyor to the machine shop on the lower floor. Basket loads of heads and bases are similarly cleaned by dipping, and then the heads and bases are transferred to hand trucks for movement to the assembly benches where further operations are performed.

Head and base parts are drawn from 0.179 in. thick hot-rolled deep-drawn steel stock; usually WD 1010 steel is employed. The heads are reamed, faced, chamfered and tapped for the fuze well cup on Goss & DeLeeuw five-spindle automatic chucking machines originally purchased for machining 40-mm. shell. These machines have been converted for operations on the bomb heads by adding a special tapping spindle and a special five-station indexing work-holding fixture in which cam-operated clamp fingers hold the workpiece in position, except at the open station where a cam holds the fingers away from the work so that pieces can be exchanged.

The five work stations are: (1) load and unload the fixture at a production rate which averages 170 to 175 per hr.; (2) rough ream, face and chamfer inside diameter; (3) finish ream and face, holding height within 0.020 in. and inside diameter within 0.006 in.; (4) chamfer outside diameter; and (5) tap for fuze well cup, using a Landis collapsible 1½ in.-12-NF-1 tap. Tapped threads must be concentric with the outside diameter of the head within 0.0030 in. (0.060 in. dial indicator reading).

In the next operation, the large inside diameter of the head is tapped for a fit with the bomb tube in a Colburn No. 4 heavy duty single-spindle drill press using a Landis collapsible 2.75 in.-12N-1 tap. Here, the workpieces are held in special tool-steel vise jaws machined to hold the piece in semi-circular cavities and having lands to engage the wrench flats on the sides of the piece. This operation is performed at a rate of about 200 pieces per hr. per machine.

All three operations on the base units are performed in single-spindle drill presses. The first operation consists of reaming and facing the large end in an Avey No. 3 single-spindle drill press with the work held in a slide-through fixture. This fixture has hardened steel guide ways tapered to engage the base on the wrench flats. The tapered sides of these ways prevent lifting of the part as the tools cut. The combination reaming and facing tool is rotated at 232 r.p.m. while reaming the 1 5/8 in. inside diameter, facing the large end and chamfering the inside and outside diameters of the part. Facing must be done against a positive stop as the height of the piece must be held within 0.020 in. These parts are checked 100 percent for height at the drill press. This operation ordinarily is performed at a rate of about 450 per hr. per machine. The next operation on the base consists of tapping the small plug in a diameter for the closing plug in a similar drill press, employing a similar slide-through fixture and a Landis collapsible tap at 118 r.p.m. Production is 400 per hr. per machine.

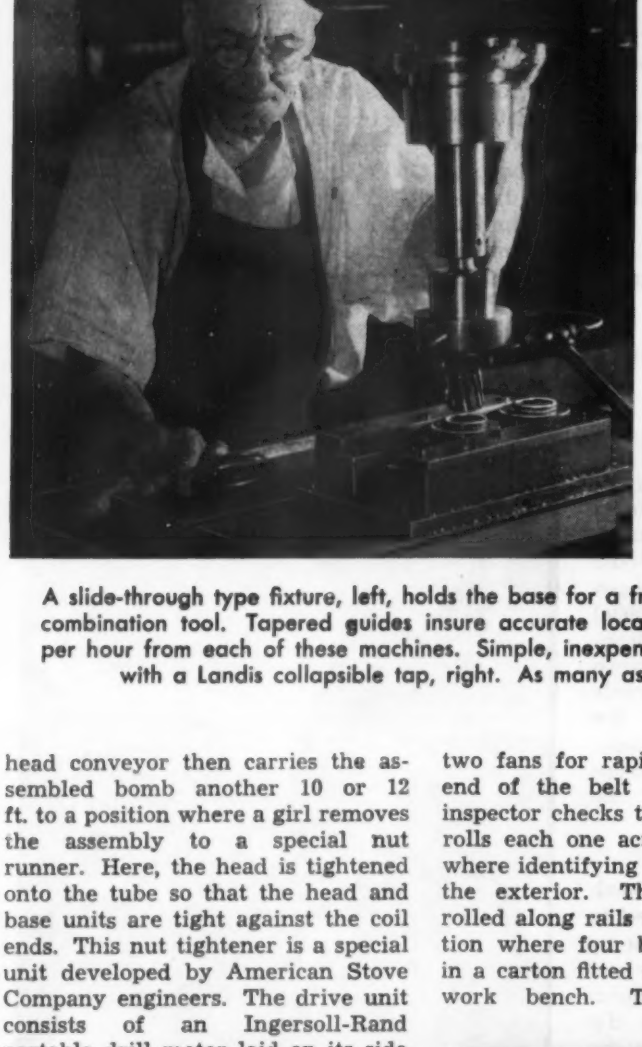
The final operation on the base consists of tapping the large inside diameter for a fit to the threaded bomb tube. This is done in a No. 4 Barnesdril manufacturing-type drill press using a standard machine vise with special semi-circular serrated tool steel jaws. Using a Landis 2.75 in.-12N-1 collapsible tap, a minimum length of 0.26 in. perfect threads are tapped at a rate of 250 pieces per hr. per machine.

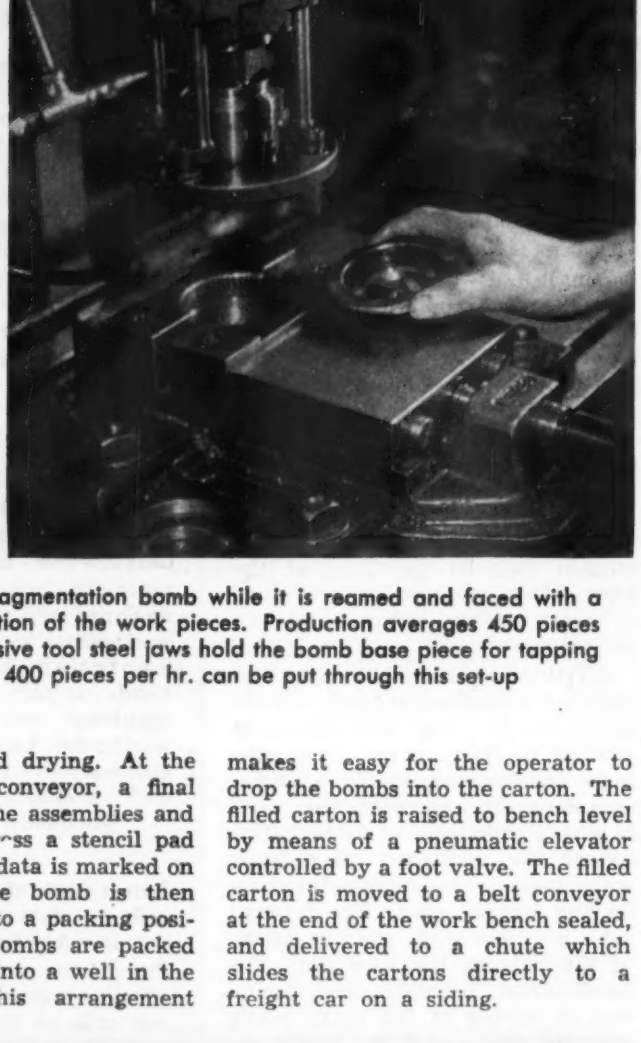
Final assembly of these fragmentation bombs is a relatively simple matter. First, a fuze well cup is assembled to the headpiece at a subassembly workbench. Then, this subassembly is checked for concentricity and the interior is spray painted with black acid-proof paint. The interior of the base piece is sprayed with the same paint.

Converted from a 40-mm. shell machining set-up, this Goss & DeLeeuw five-spindle automatic has been equipped with special workholders for fragmentation bomb heads. A cam circle supported over the workholder faceplate automatically clamps and unclamps the workholders

Basket loads of bomb coils are delivered to the assembly floor by the same conveyor which moves individual coils to the dip painting tank at the left, and then to the final assembly line.

Bases and bomb tubes are delivered to a work bench near the overhead conveyor line. Here, three girls perform a series of operations. The first girl swabs the threads in the base with paint and starts the base on a tube. The second girl, also working at the bench, tightens the base onto the tube with homemade nut runner which incorporates a Twin-Disc friction clutch. The third girl lifts the tube assembly to a nearby conveyor line and inserts it into a coil as it passes her position. Further along the line, another girl starts a head assembly onto the other end of each tube. The over-





A slide-through type fixture, left, holds the base for a fragmentation bomb while it is reamed and faced with a combination tool. Tapered guides insure accurate location of the work pieces. Production averages 450 pieces per hour from each of these machines. Simple, inexpensive tool steel jaws hold the bomb base piece for tapping with a Landis collapsible tap, right. As many as 400 pieces per hr. can be put through this set-up

head conveyor then carries the assembled bomb another 10 or 12 ft. to a position where a girl removes the assembly to a special nut runner. Here, the head is tightened onto the tube so that the head and base units are tight against the coil ends. This nut tightener is a special unit developed by American Stove Company engineers. The drive unit consists of an Ingersoll-Rand portable drill motor laid on its side and clamped to the bench surface. The spindle of this motor carries a wrench head which fits the flats on the headpiece of the bomb. At the other end of this unit is a similar wrench head which fits the flat on the base of the bomb. The second wrench head is carried on a slide which is moved against the bomb assembly by a small Hanna non-rotating air cylinder so that the wrench heads at each end are tightly held against the head and base of the bomb.

Finished bomb assemblies are moved from this tightening machine by hand to an inspection bench where company and Ordnance Department inspectors check every assembly. Accepted bombs then are moved to a constantly moving belt conveyor where closing plugs are inserted in the heads and bases, and the heads are hand-brushed with paint. The belt conveyor carries these painted assemblies between two fans for rapid drying. At the end of the belt conveyor, a final inspector checks the assemblies and rolls each one across a stencil pad where identifying data is marked on the exterior. The bomb is then rolled along rails to a packing position where four bombs are packed in a carton fitted into a well in the work bench. This arrangement makes it easy for the operator to drop the bombs into the carton. The filled carton is raised to bench level by means of a pneumatic elevator controlled by a foot valve. The filled carton is moved to a belt conveyor at the end of the work bench sealed, and delivered to a chute which slides the cartons directly to a freight car on a siding.

Heads are assembled to the bomb tubes after tube and coil have been put together on the assembly conveyor. A pneumatic drill motor provides power for tightening the head on the tube at this station

Suggestions for Improvement Of Twist Drills—DISCUSSION

Twist drill breakage has been ascribed to faults in their design. Mr. Holman disagrees; he says that spoilage is the result of improper handling

BY GEORGE HOLMAN

THE ARTICLE by George J. Meyer in a recent issue entitled "Practical Suggestions for the Improvement of Twist Drills" concludes that the major causes of twist drill breakage lie in the design of the drills and driving methods, rather than their misuse and abuse. Although all mechanical devices may have design weaknesses incorporated as a matter of expediency in the induction of a desirable end effect, it is not reasonable to condemn the design in general on the basis of these weaknesses.

Most drill breakage is due not to a fault in the design of the drill but to its misuse. Drill breakage is most often the result of two or more abusive conditions which are usually preventable.

The workpiece should be firmly gripped by means of clamps or a sufficiently heavy vise, to resist the torque applied by the drill. A loosely held workpiece will slip and grab intermittently and thus place torsional shock loads on the drill in excess of its capacity to resist them. This type of abuse results in a portion of the drill shattering. Usually, that part immediately outside the hole is the point of breakage.

The same type of break may occur if the work is held firmly but the drill feed is too heavy. An excessively heavy feed will build up a chip that cannot be broken by the drill, thus jamming the drill in the hole in the same manner as a loosely held workpiece.

A rate of feed that may not be excessively heavy for drilling the body of a hole may be too heavy where the drill breaks through the underside. The angle of the drill point acts as a wedge when the metal at the bottom of the hole becomes thinned. As soon as the point breaks through, a heavy burr is thrown up at the edges of the hole. The cutting lip of the drill bites into the burr, jams and shatters the drill. This situation can be avoided by stopping the heavy feed at the point of break through and feeding lightly while drilling past the burr. The burr can be prevented entirely, along with the time required to remove it, by using a back-up piece of wood or metal on the underside.

Drill breakage caused by jamming at the point of breakthrough is more frequent if the workpiece is made of a tough metal such as copper or monel. If the drill is properly sharpened, breakage rarely occurs at breakthrough in gray iron or annealed high carbon steel. Gray iron crumbles out, while steel resists the cutting edge of the drill until the breakout burr is thinned sufficiently for the flute edges to mill it off.

Another common cause of breakage is wedging of the drill in the hole. This may be caused by the burning of a carbon steel drill or, in drills of high-speed steels, it is often caused by gradual tapering of the drill due to wear of the flute edges as they rub against the work. These edges may wear on otherwise well-sharpened drills which retain good cutting lips in frequent service. The worn flute edges are often overlooked until the tapered drill wedges in the work and breaks.

To correct most of the difficulties that Mr. Meyer concludes are faults in the design of the twist drill, a few simple precautions in use and maintenance of drills will be useful, if properly applied.

First, the cutting edges of the drill should be kept in a sharpened condition. At the time of sharpening, the drill should be checked for taper of the flutes and if necessary, ground to the next undersize to eliminate taper. This will insure that no drills will be lost due to jamming of a tapered drill.

Rates of feed should be set to insure a clean cut, without jamming, at breakthrough. The rate of feed for a shallow hole may be set to the rate required for a clean breakthrough without appreciable loss of time. For a deep hole, the feed rate should be set for the body of the hole and decreased at the point of breakthrough.

Wherever possible, a back-up piece should be used to prevent or minimize the formation of a breakthrough burr.

The workpiece should be firmly supported against the drilling pressure to prevent spring back in the material.

Positive clamping arrangements should be provided for the workpiece to resist the torque applied by the rotating drill.

In field work and in emergencies, it is often advisable to sacrifice a drill rather than lose the time of a machinist or erector. Many drills are broken in repair shops because of the necessity of using a twist drill at higher feeds, or in other unusual service beyond that for which it was designed. A dull drill may break because, in the judgment of the man using it, the risk of using a dull drill offsets the delay required to sharpen it.

When a job is worth it, a broken drill should be looked upon as incidental waste and is no more to be kept in a rack and mourned at each inventory than the drill shavings.

Since dull or poorly sharpened drills are so often the cause of breakage, a sharpening machine which would include provision for thinning the web would be a welcome addition to any machine shop. Given such a sharpener, plus modern presses, lathes and mills, a good cutting fluid and machinists who are machinists, the breakage of twist drills will become negligible, or entirely disappear.

Sharpening Face Mills and Form Relieved Milling Cutters

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE COMPANY

Description of sharpening methods is continued with details on the handling of two more types of cutters in this eleventh part of the author's series on milling

SHARPENING of peripheral and formed profile milling cutters was discussed in the tenth article of this series. Now attention can be given two other types: face mills and form relieved cutters. In face mills, the clearance on (1) the periphery, (2) the face and (3) the chamfered or rounded corner is ground by a method similar to that used in grinding plain milling cutters.

Face milling cutters up to 8-in. diameter are mounted for sharpening on a workhead provided with the necessary means for obtaining the clearance angle. Larger diameter face mills are ground in the set-up shown in Fig. 61. Either Formula 14 or Tables 6, 7 and 8 (see Part 10 of this series) can be used in determining the distance *H* required to produce the desired clearance angle.

Fig. 61—Grinding the face of a large shell end mill is done in this set-up

Face milling cutters of the shell end mill type are ground like face mills, and they are held on the spindle of the standard universal workhead (which is provided with the clearance setting dial).

So that the teeth in a face will run true with respect to the axis of rotation of the cutter, the face of the cutter should be surface ground on the face cutting edges (Fig. 62). The narrow flat land which results in this operation will be reduced to a width of between 0.002 and 0.003 in. when the clearance is ground on each tooth. It is not necessary for the operator to check each tooth by means of an indicator, since the tooth has been trued in the surfacing operation.

The periphery of the face mill can be treated in the same manner by grinding a circular land which will finally be reduced to a narrow, almost hairline width when the clearance angle is ground on the periphery of the cutter.

In cutters having a chamfered corner, the corner should similarly first be provided with a circular land, which is a part of a conical surface, and as in operations on the face and periphery, this land will be subsequently reduced when the clearance land is ground on the chamfer. In facing cutters having a rounded corner, the circular land and the clearance can be obtained on a radius grinding attachment.

The procedure described for

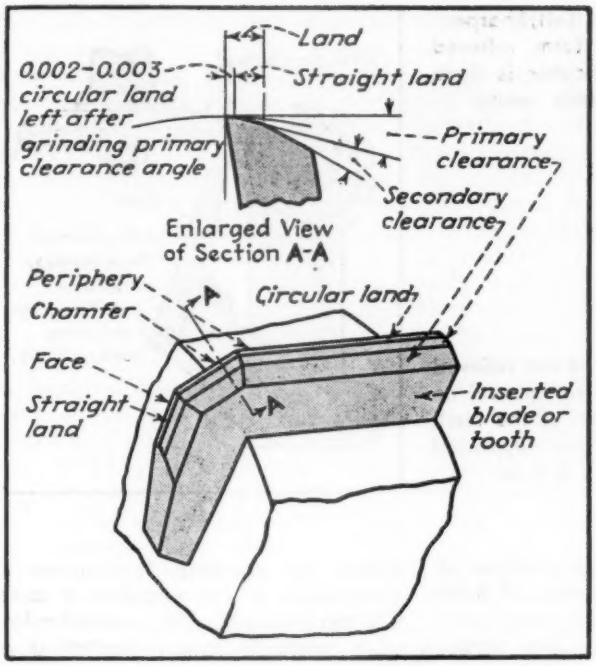


Fig. 62—A view from the clearance side of an inserted tooth in a face mill shows the circular ground land, and the primary and secondary clearances

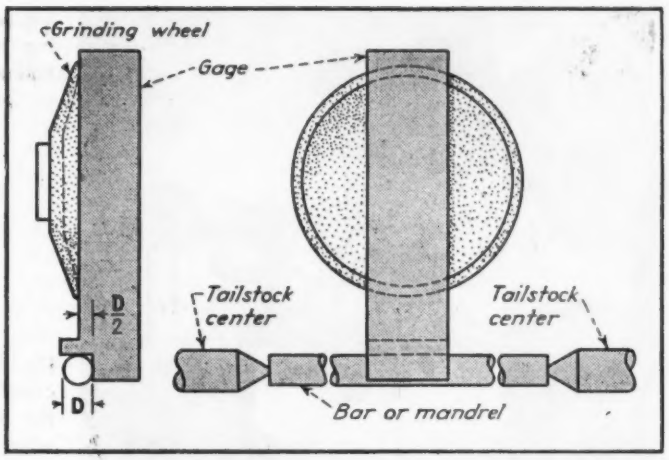


Fig. 63—A gage is used to place the face of the grinding wheel on the center line of the tailstock

sharpening peripheral milling cutters cannot be used in the case of form relieved cutters. In this type of milling cutter, the clearance is produced during manufacture and cannot be ground without seriously affecting the accuracy of the profile. Consequently, form relieved cutters are sharpened by grinding the faces of the teeth.

Form relieved cutters made with teeth having zero radial rake (radial face) should always be sharpened radially, as indicated in Fig. 64.

The face of the grinding wheel should be lined up with the centers on which the cutter is mounted. This can be accomplished readily by means of the gage shown in Fig. 63. The face of the wheel should be trued with a diamond before using the gage.

Form relieved cutters having teeth provided with a positive radial rake angle or "undercut" should be sharpened in a plane tangent to the base circle (Fig. 65). This is generally done in accordance with marking on the cutter which specify the amount of rake in degrees or in thousandths of an inch of base circle radius.

If the rake angle is in degrees, the dimension d indicated in Fig. 65 which gives the set-over of the face of the grinding wheel with respect to the center of the cutter (base circle radius) can be calculated by means of the following formula:

$$d = R \sin r$$

where:

R = the radius of the cutter, in.
r = the rake angle in degrees, and
d = the amount of set-over in inches (base circle radius)

The following points should be observed in sharpening form relieved milling cutters:

1. The tooth being ground should be supported by a tooth rest blade contacting the back of the tooth, as shown in Fig. 65 and Fig. 66. To obtain uniform tooth height, a spot should be ground on the back of each tooth by indexing from the form of the same tooth (Fig. 67). As a tooth is indexed, the solid stop locates the back of the tooth in a position corresponding to equal distance of the form from the center of the cutter. This eliminates errors in machining and distortion caused by heat-treating. These corrections, however, cannot be made by grinding the back or the face of the teeth by means of an index plate because of the variations in tooth spacing caused by machining errors or distortion in heat-treating.

The cutter should be checked for uniform tooth height by means of an indicator.

2. Form relieved milling cutters should not be allowed to become too dull, but should be resharpened as soon as the cutting edges show signs of wear.

A flat appears on the back of each tooth as it becomes dull, and the width of this flat increases as the dulling progresses. If a flat 1/16 in. wide is permitted to form on the teeth, that much metal must be

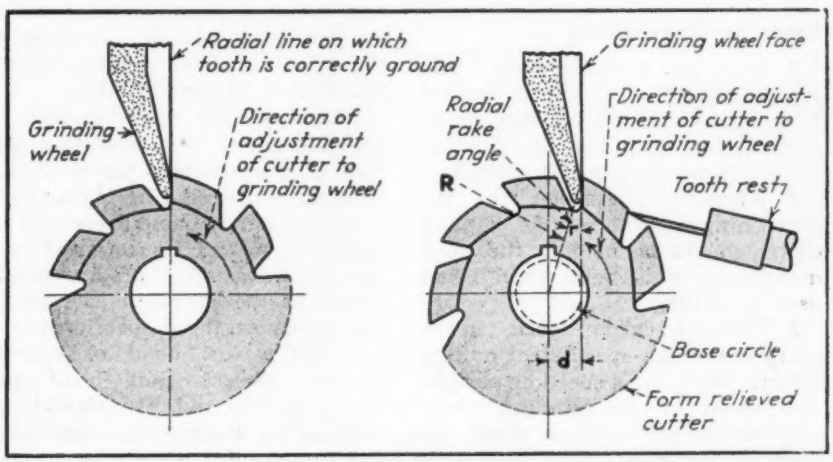


Fig. 64—The correct position of the face of the grinding wheel with respect to the center of the cutter is shown for a form relieved cutter having a zero rake angle. Fig. 65—The proper relation of the grinding wheel and the tooth rest is illustrated for a form relieved cutter with a positive rake angle

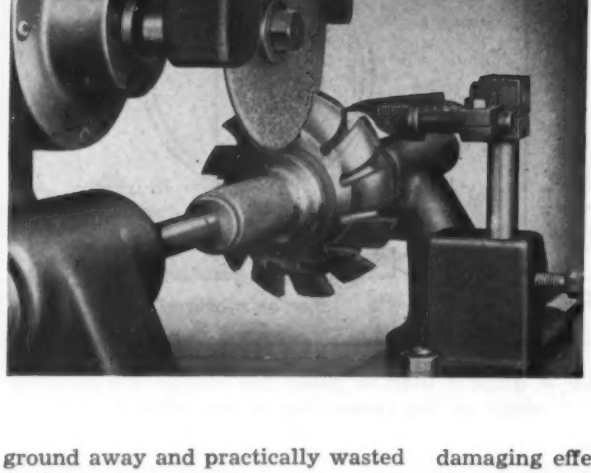


Fig. 66—(Left) Sharpening a form relieved milling cutter is done in this set-up

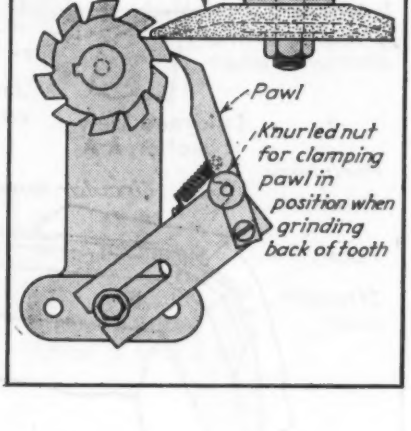


Fig. 67—Form relieved cutters are ground on the back of the teeth which are supported by a pawl

ground away and practically wasted during resharpening.

3. Form relieved cutters should be resharpened within close limits to the same rake and helix angles provided in manufacture. If these angles are not accurately maintained, the contour of the cutter will be changed and a similar change in contour will appear on the work.

When an unusually accurate form is required, or a change in the form has resulted from the accumulated errors of several resharpening operations, the rake angle can be changed slightly to correct and restore the form. An increase in the rake angle over the original angle will result in a narrower form or contour, while a decrease in the rake angle will broaden the form.

4. Gages should be used for checking the rake and helix angles when accurate contours must be maintained, as in the case of formed cutters for cutting gear teeth, turbine buckets, etc.

Rules for Sharpening

1. *Keep the machine clean.* The grinding machine should be cleaned frequently, and all moving parts protected from the abrasive dust resulting from the grinding operation.

2. Whenever possible in the sharpening operation, the milling cutter should be held in the same manner as it is held when being used in milling.

3. *Use a low cutting speed.* In resharpening high-speed steel milling cutters, the cutting speed or peripheral speed of the grinding wheel may be varied between 4,500 and 6,500 ft. per min. It is preferable to use a low cutting speed to prevent too high a temperature from being developed during the sharpening operation, with consequent damaging effects on the material of the cutter. Cutting speeds of 5,000 to 5,500 ft. per min. are used in resharpening milling cutters tipped with sintered-carbide material.

The peripheral speed of the grinding wheel can be calculated by means of the following formula:

$$S = \frac{D\,n}{12}$$

where:

D = the diameter of the grinding wheel in inches,
n = the revolutions per minute of the spindle, and
S = the cutting speed in feet per minute.

High-Speed Steel Cutters

1. *Sharpen cutters DRY.* Sharpening of high-speed steel milling cutters is best performed dry. This permits a clear view of the work by the operator while performing the grinding operation. The operator should always wear goggles to protect his eyes from particles which are projected in all directions as the grinding wheel disintegrates or breaks down during grinding.

2. *Maintain the proper form of the grinding wheel.* The operating surface of the grinding wheel should be carefully dressed by taking light passes with a diamond dresser. This operation should be repeated frequently to maintain proper cutting action of the grains in the wheel and to restore the proper form.

3. *Use a soft bond or coarse-grained wheel.* Soft bond and coarse-grained wheels should be used in preference to hard bond and fine-grained wheels, to prevent "burning" or overheating of the material near the cutting edge and drawing its temper. When the material near the cutting edge is overheated by grinding, it assumes a straw color and the surface is usually very smooth. The natural color of a properly ground cutter is a silvery gray.

The grinding wheel should disintegrate gradually as the individual abrasive grains wear smooth. If this does not happen, the wheel becomes "glazed" and the cutting action ceases. Friction and consequently the amount of heat are increased.

Softer wheels cut easily and develop less heat. High temperature causes heat cracks or "checks" in the tool. For this reason, every effort should be made to select the proper combination of cutting speed and type of grinding wheel to obtain free-cutting conditions with a low operating temperature.

Soft wheels wear faster, often a point of major concern. Actually, however, *the proper grinding of a milling cutter tooth should receive closer attention than the time required or the amount of wheel wear.* If the sharpening of the tooth is not done accurately and carefully, the cutter will give but mediocre performance, and will also affect the operation of the milling machine.

4. *Use a light grinding pressure.* The tooth of the cutter should be brought into contact with the grinding wheel with a very light pressure. The area involved in grinding milling cutter teeth is ordinarily narrow, but in certain cases, a wider area will be in contact with the grinding wheel. To avoid too high a temperature, lighter passes must be taken when grinding a wider area than when grinding a narrow one.

The amount of stock removed from each tooth should not exceed 0.002 to 0.003 in. per pass on large *high-speed steel* cutters, such as plain milling cutters and face mills.

When grinding saws and narrow slotting cutters, the amount should be in the range from 0.0005 to 0.0015 in. If more stock is removed or the cutter is traversed past the grinding wheel at too high a speed, the heat generated may draw the temper of the material, resulting in a softening of the cutting edge.

In backing-off operations such as the grinding of a secondary clearance in high-speed steel milling cutters, the amount of stock removed per pass may be greater than that shown above. Since this is a roughing operation performed on the back of the tooth where there is plenty of metal to carry off the heat, a high temperature is unlikely.

5. *Sharpen cutters frequently.* The resharpening of a milling cutter should not be delayed to the point where the cutting edge has become badly worn and considerable grinding will be necessary to restore its original condition. The continued operation of a cutter under such conditions produces a poor finish on the milled surface, and in the case of high-speed steel cutters, the heat generated at the cutting edge is often sufficient to draw the temper of the steel and soften it to a greater depth than would normally be removed in the sharpening operation. In this condition the cutter will not last as long as it would if it had been ground at the proper time.

6. *Use the correct clearance for the work material and type of cutter.* The clearance angle should be selected in relation to material cut and type of milling cutter employed. There is a tendency in many shops to use the same clearance angle for all types and sizes of milling cutters and on all kinds of material being cut. This practice is not advisable because, for every cutter and metal cut, there is one definite clearance angle which will insure maximum production and most efficient cutter performance. This cannot be attained with any other clearance.

7. *Follow grinding with stoning.* After the cutting edge of a milling cutter has been sharpened, it should be stoned to remove the burr produced in grinding. Hand stones can be used for this purpose. The hand stones are made in coarse, medium and fine grain sizes corresponding to the 100, 150 and 200 grain size used for grinding wheels.

Stoning of the surfaces adjacent to the cutting edge will reduce the roughness produced by grinding marks, also reduces the friction and heat produced in formation of the chip. The stoning should be done by moving the stone or hone against the edge with a light, even pressure.

8. *Proper preparation of the cutting edge.* Other important factors affecting the efficiency of the cutter are the keenness of the cutting edge and the finish on the face and land clearance of the tooth.

A milling cutter with clean cutting edges and a high finish, free from burrs and grinding marks, will have more efficient cutting action, produce a better quality of finish on the machined surface, and last longer than a cutter with edges showing a poor finish. If not properly ground, the cutting edge appears as an irregular saw-tooth shape when viewed under the microscope.

This condition produces an irregular flow of the material of the chip and a rough machined surface. It also results in a concentration of stress, high friction and localized heating, which tend to accelerate tool breakdown.

Smoothness of the cutting edge and finish on the face and land clearance of the tooth of 1.0 to 1.5 microinch are desirable, but 3.0 to 4.0 microinch (r.m.s.) are commonly used. After rough grinding, this finish can be obtained with a fine grit wheel as a final conditioning operation, using grinding wheels with a grain size of 80 to 120 for high-speed steel cutters. Particular care must be exercised to prevent overheating of the cutter material, taking light passes not exceeding 0.0005 in., and preferably less.

Sharpening cast tool material cutters. Cutters of cast tool material should be resharpened as recommended for high-speed steel cutters in the preceding information.

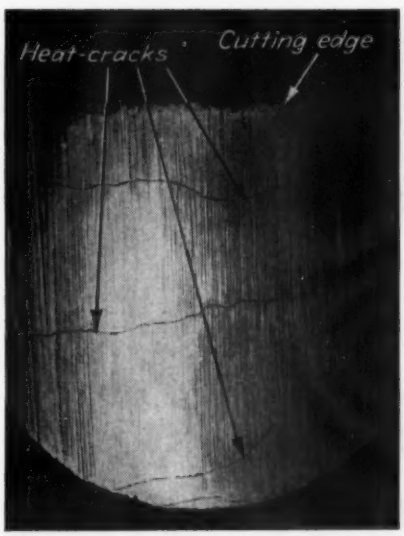


Fig. 68—Photomicrograph of sintered carbide tip, which has been ground with a 120-grit green wheel, shows heat cracks developed by grinding

Sintered-Carbide Tipped Cutters

In sharpening sintered-carbide cutters, particular care should be taken to avoid the formation of heat cracks or "checks." This will occur if the feed is too fast, the stock removed is too great, or if the wheel is permitted to load or glaze. The amount removed per pass should be 0.00015 to a maximum of 0.0004 in. depending on the grit of the grinding wheel and the operation, that is, roughing or finishing. Heavier stock can be removed when rough grinding and correspondingly less stock when finish grinding.

(*a*) Diamond wheels are used almost exclusively in sharpening sintered-carbide cutters. They cut faster and generate only a limited amount of heat unless excessive pressure is applied to the work in grinding. High temperature causes cracks as shown in Fig. 68. The selection of the grinding wheel is governed by the type of operation and the speed available in the machine and the degree of finish desired. With an 80 to 150 grit wheel it is comparatively easy to rough grind for stock removal. An excellent cutting edge can be obtained with 180 to 240 grit wheels and a keen edge with a mirror finish can be produced with 320 to 500 grit wheels.

(*b*) Before sharpening, sintered-cutters should be inspected with a low power microscope to determine if there are cracks in the tips and how far the cracks extend into the body of the tip. If the cracks are too long it might be advisable to replace the cracked tips with a new tip, rather than to grind off the necessary stock to remove the cracked portion of the tip.

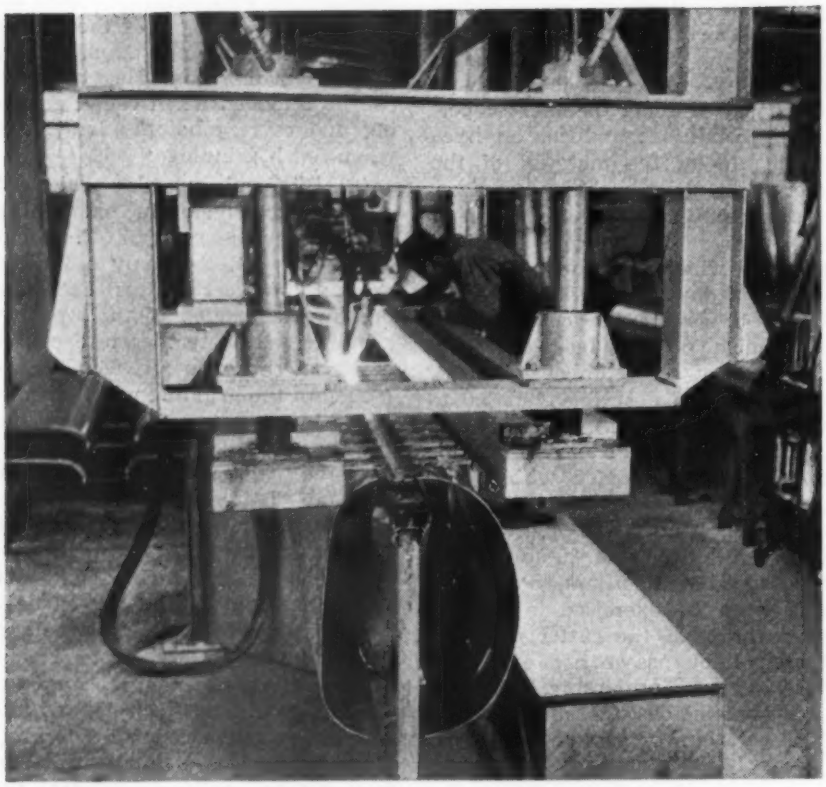
(*c*) Surface grind the face and circular grind the chamfer and periphery as explained in the foregoing, Fig. 62.

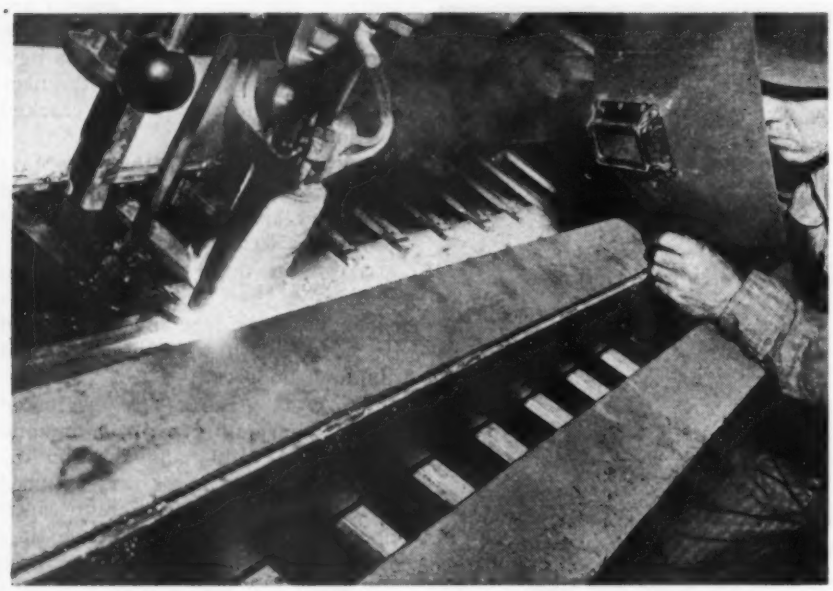
(*d*) After the grinding has been completed, the cutter should be inspected and the face and land should be honed with a 400 or 500 grit diamond hone.

(*e*) Wet grinding is preferred when sharpening with diamond wheels. A mild soda solution diluted with compounds may be used as a coolant. Strong alkaline solutions should be avoided, since they are injurious to bakelite bonding. However, the wick and oil method of moistening the face of the wheel is still largely used.

Automatic Carbon Arc Welding Found Advantageous for Aluminum

BY W. J. CONLEY, CONSULTING ENGINEER, THE LINCOLN ELECTRIC COMPANY





The aluminum gas tank is held on the copper backing bar by the closely spaced fingers of the air-operated clamping fixture

Fabrication by the carbon arc method promises to widen the field of use of aluminum and its alloys. The method permits faster and more uniform welds

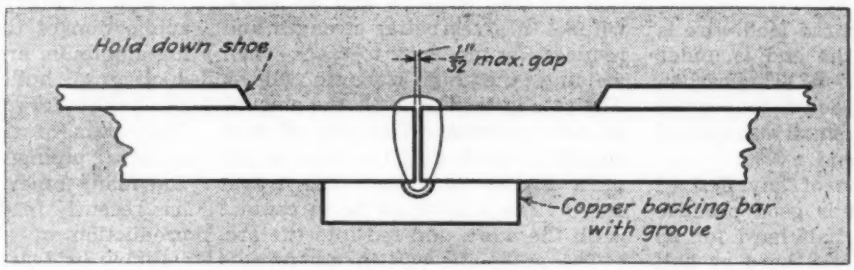
WHILE THE automatic carbon arc welding of general-purpose steels is commonly known and widely used in many fields of industry, the process as applied to aluminum and aluminum alloys has just recently been coming into its own. This is believed to be particularly significant in view of the rapidly increasing uses of aluminum in various structural designs.

The automatic carbon arc has many advantages in welding aluminum and its alloys where the production of similar parts is of sufficient volume. Physical properties, appearance and uniformity of the welds are superior to those made by any other process.

Aluminum and aluminum alloys can be welded automatically with the carbon arc by feeding bare metal wire into the arc filler. The molten metal and solidified hot material are protected by means of a powdered flux deposited automatically ahead of the arc.

Automatic welds can be made at higher speeds than manual welds. In addition, independent and separate control is possible for the arc current, voltage and speed. The same holds true for the amount and analysis of filler metal and flux. The fusing of the parent metal may form the joint with a minimum amount of filler metal or none at all depending on the amount of build-up. The spatter of the molten metal is absent and distortion is reduced by control of the heat on the bare metal.

As in the case of steel, this method can be used for any type of properly positioned joint. The procedures given here have been de-



Welding of Square Butt-Grove Joints

Plate thickness in.	Travel speed* in./min.	Amps.	Volts	Filler wire			Flux		Backing strip grove in.	Clamp spacing in.
				Feed in./min.	Feet of weld per lb. of wire	Wire size in.	Feed oz./min.	Feet of weld per lb. of flux		
0.064	36	140	25	36	65	1/8	0.5	100	0.025 × 1/4	1/2
0.125	28	300	28	36	50	1/8	0.9	40	0.050 × 3/8	3/4
0.187	20	325	29	25	35	5/32	1.1	24	0.050 × 3/8	1
0.250	16	350	30	20	35	5/32	1.1	19	1/16 × 3/8	1-1/4
0.312	14	375	30	20	30	5/32	1.1	17	1/16 × 3/8	1-1/2
0.375	12	400	32	20	25	5/32	1.1	14	1/16 × 7/16	1-1/2
0.500	8	425	33	12	20	3/16	1.1	10	1/16 × 7/16	1-1/2
0.625	6	450	35	12	15	3/16	1.1	7	1/16 × 7/16	1-1/2

1/8 in. wire 0.015 lb. per ft. 67 ft. per lb. 5/32 in. wire 0.023 lb. per ft. 43 ft. per lb. 3/16 in. wire 0.033 lb. per ft. 30 ft. per lb.
*These speeds are conservative for the weldable aluminum alloys.

To obtain the speeds given in the table the following precautions must be observed:

1

The edges must be dry, free from grease, dirt and other foreign material. This is accomplished by degreasing, chemical treatment, use of steel wool or any other effective means.

2

For uniform results the edges must be fitted tightly or with a maximum gap of 1/32 in. When tack welds are used they must be flat and made with high current to give deep penetration. If the tacks are high they should be chipped flush. To avoid a crater at end of weld, an end tab should be tacked in place for the finish end of the joint. The start can be made without a tab.

3

Copper is the best backing material, and a groove is necessary to assure complete penetration. The backing strip must be tight against the under side of the plate.

4

Clamps should be used to hold the work in position to prevent distortion and the flowing away of the flux. The proper current, voltage, speed of arc and wire speed must be selected for best weld results. The flux must be dry and used in the correct amount. The current setting is the minimum which will produce continuous complete penetration, for excessive current causes holes. Proper voltage is the minimum amount which does not interfere with the efficient melting of the wire. Travel speed is the basic adjustment for current, wire speed and flux rate.

5

The correct amount of flux produces dense welds, good appearance and proper elongation. Too little flux gives a rough bead appearance, while too much may show a good surface. However, there is a possibility of porosity at the fusion line and a reduction in elongation if too much flux is used. A crusty seam on the weld crater is a good criterion by which to judge the correct quantity of flux. The flux has a tendency to pick up moisture but storage in a cabinet held at room temperature or slightly higher will prevent this. The container should be covered, and the hopper or flux feed mechanism emptied when not in use. To prevent rusting, the fixtures and adjacent equipment should be kept free of flux.

6

The arc should be controlled so that it always flows slightly backwards or extra cost will result. The arc control mentioned can be accomplished by an a.c. field around the carbon and by changing the position of the ground. Copper or steel close to the boot reduces the a.c. field. The bottom of the water-cooled boot should be 2 in. above the work to prevent collecting of hot slag.

veloped, for the square butt joint, in accordance with the latest information.

To start the weld the feed wire is advanced so that the end is under the tip of the carbon. The carbon spindle is pushed down to contact the wire. Then a small amount of flux is added by hand.

The filler can be of any desired composition, but it is good practice to use 2S hard or half hard for 2S and 3S plate, and 43S hard or half hard for 14S, 24S, 52S and 61S material. 2S wire gives better elongation for use with 2S and 3S stock while 43S gives better strength and reduces the tendency to crack when welding the high-strength alloys. The rate of feed controls the amount of reinforcement. The size of wire should be such that the wire is fed at a higher rate than the travel speed. The wire must be in contact with the work and fed into the arc.

The automatic carbon arc process of welding is also successfully used for T, fillet, lap and corner welds.

Good examples of the practical application of the process in welding aluminum are shown in the production of bullet proof aluminum gas tanks for "Flying Forts," the fabrication of aluminum tank cars, boilers, piping, automotive parts and many other items. The process has recently made possible the mass production of aluminum parts for military bridges.

Aids for Punching Stringers On a Press Brake

LONG aluminum-alloy stringers for B-29 bomber fuselage and wing sub-assemblies are multiple punched for rivet holes in press brake set-ups at the plant of the Wichita-Division of the Boeing Airplane Company. Strippit and similar individual punch units are spaced along the bottom die of the press brake to assist the requirements of the individual stringers to be punched. A number of suggestions made by Boeing-Wichita employees have resulted in improved tools and methods for these stringer punching operations. Two of these developments are shown in the accompanying illustrations.

When the stringers for various sub-assemblies of the B-29 bomber are relatively wide and of irregular shape, it sometimes is difficult to align them properly for punching skin rivet holes. Several suggestions by Boeing-Wichita employees have resulted in the development of a number of special support guides which are spaced along the bottom die holder of the press brake. Each of these guides is equipped with a roller for easy movement of the stringer, as it is inserted from one end of the machine. Other guides have both horizontal and vertical rollers for locating the stringers with relation to the punch units

Accurate spacing of the Strippit punch units along the bottom die block of the Cincinnati press brake is a long and tedious job if each setting is made to scale measurement. By providing a templet with pins spaced properly along its length, each of the punch units can be moved until its die hole matches one of the pins in the templet. The templet is positioned against a stop clamped to the bottom die block. When all of the punch units have been spaced properly, they are clamped in place and the templet is removed

Canadian Plant Avoids Handwork In Making Torpedo Propellers

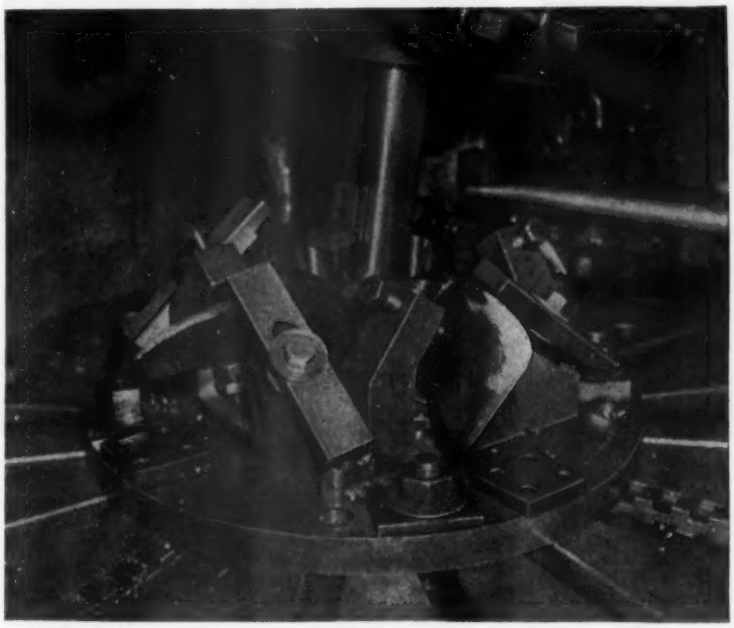
BY CHESTER S. RICKER

Modern profiling equipment was chosen for rough machining the blade contours, but finishing operations are performed upon ingenious machines designed by the company's tool engineers

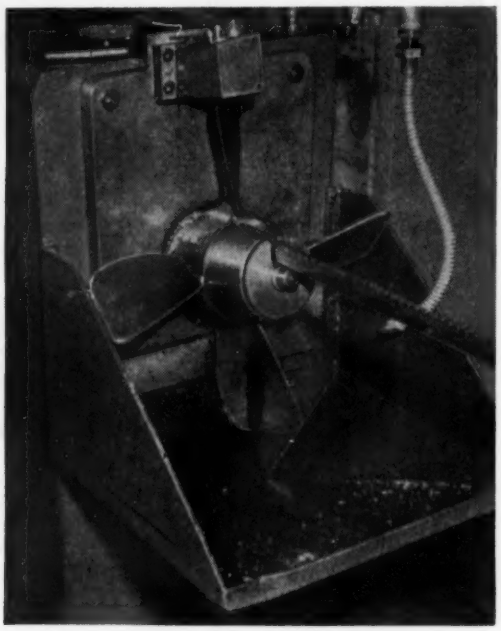
WHEN Genelco, Ltd., Peterborough, Ont., Canada, undertook the manufacture of steel propellers used on 18-in. torpedoes for the Royal Navy, they were confronted with the fact that the existing production methods required hand finishing with files, hand grinding tools and scrapers to make the propeller blades conform to the curves and twists specified. This required skilled operators, diemakers and men trained in naval-ordnance methods. Genelco, in a small Canadian city, did not have them and what was worse had no chance of importing such trained workers. Hence they decided to make the propellers with as little handwork and as much unskilled female labor as possible. The only hand operation now is buffing the otherwise finished propeller.

Not only are the machine-made propellers finished in fewer hours but there is practically no spoilage. Many handmade propellers were spoiled even by trained men since undercutting at any point meant complete loss of an almost finished "prop." The hand procedure was to chip, file, grind and buff to profile gages. It was not easy to get perfect contours and it was easy to spoil them by over-zealous use of any of the tools used.

The greatest satisfaction the production men, I. F. McRae, works manager, and R. Barnacal, general superintendent, obtained on this job, was the opinion expressed by officers of the British Admiralty Technical Commission that the propellers manufactured at Genelco are of a particularly high quality.



Centering "Prop" and Boring Taper. Jacks under blades allow centering and leveling, clamp screws position the back of blades, and clamps hold blades tight against jackscrews. Entire fixture can be moved on table to center the bore. Hub finished at one setting: Top face is roughed first, taper is rough bored and finished with Carboloy tool at high speed and fine feed for smooth finish, top face finished to plug gage, and bottom face roughed and finished to over-all length

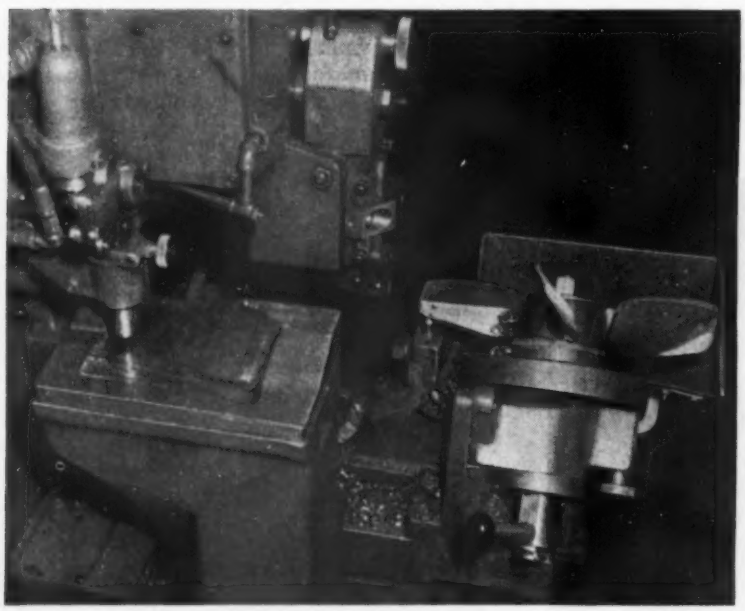


Broaching Keyway Parallel to Taper Bore. By using a thin tapered bushing for the larger bore, one broach and one fixture can be used for both fore and aft propellers although they have different bore diameters. A knife-edged pin locates the top blade relative to the keyway. A supporting strip determines the keyway depth

OPERATION SHEET FOR 18-IN. PROPELLER

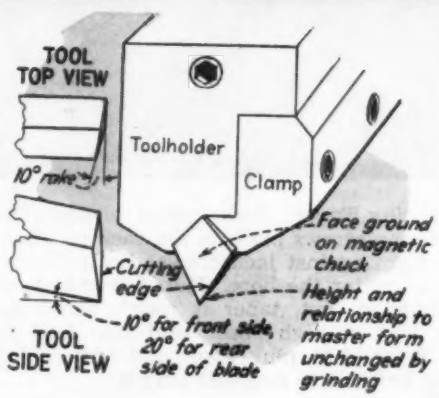
OPERATION NO.	AVERAGE TIME, MIN.	TYPE OF OPERATION	MACHINE USED	TOOL USED	REMARKS
1	18	Remove projections	Cincinnati vertical mill	Side of stub cutter	
2	15	Centering "prop"	On Bullard		
3	60	Boring taper in hub	Bullard vertical turret lathe	Carboloy tools in boring bars	Rough top face, rough and finish bore, finish top and bottom faces
4	2	Keyseat hub	XL20 Oilgear broach	Broach	Same broach used for two diameters in fore and aft "props"
5	Fore 38 Aft 47	Shaping	Rockford hydraulic shapers	Special Carboloy tool	
6	93	Milling hub	Keller Duplicator or Cincinnati Hydrotel	$\frac{7}{16}$ in. radius, ball end mill	Steps $\frac{1}{16}$ to $\frac{1}{4}$ in.
7	56	Profiling	Pratt & Whitney profilers	1-in. dia. end mill	
8	10	Blending hub and edge of blade	Pacemaker lathe		This is only the trailing edge
9	60	Rough grind front face of blade	Converted "Index" vertical hand mill	6 × $\frac{1}{4}$ in. grinding wheel	Girl operator
10	75	Grind back of blade	Special machine with rubber-rim grinding wheel	6 × $\frac{1}{2}$ in. abrasive band	
11	54	Finish front face of blade	Similar to operation 10		Girl operator
12	45	Grind hub	Special machine	48 × $\frac{3}{4}$ in. abrasive belt	Belt speed 5,000 f.p.m.
13	20	Blending hub and edge of blade	Special machine	Abrasive belt	
14	28	Final buffing	Buffing lathe	16 in. felt wheel	For appearance. (Only hand operation on propeller)
15	10	Stamping	Indexing fixture		

Total time: 9 hr. 53 min.

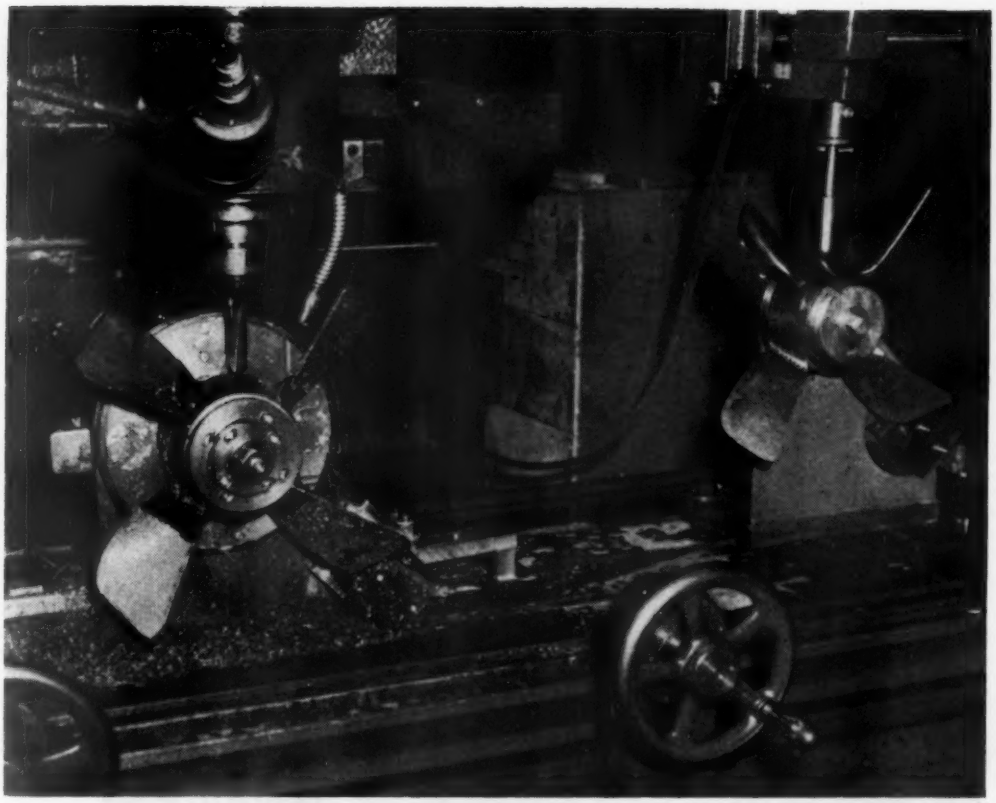


Shaping Front of Blades. Hydraulic shapers are used for machining both front and back of blades. Tool cuts toward the hub, lifts to clear hub radius. After the rough and finish cuts, the stock left for grinding is 0.010 to 0.015 in.

Special Toolholder for Shaping Blades. For shaping the front of the blade the toolholder is made to hold the toolbit at 20 deg. from horizontal; for shaping rear of blade, at 10 deg. The tool is made of $\frac{5}{8}$ in. square stock with two bottom sides ground to an included angle of 60 deg. One side of the point does the cutting



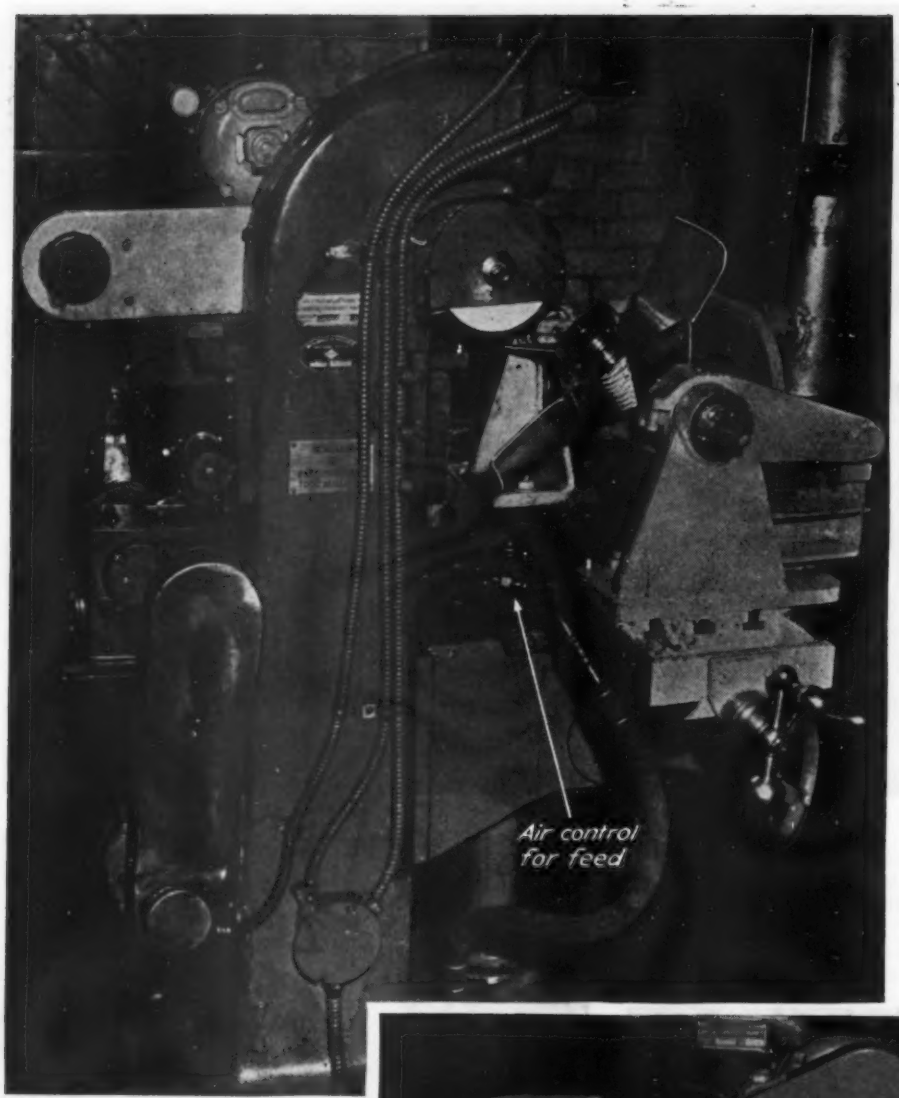
Shaping Back of Blades. A special toolholder and tool are used for rough facing the back of the blade. This tool only requires grinding on top rake when resharpening. This holder permits tool to be reground without disturbing height or side position in shaper, a good point in production work



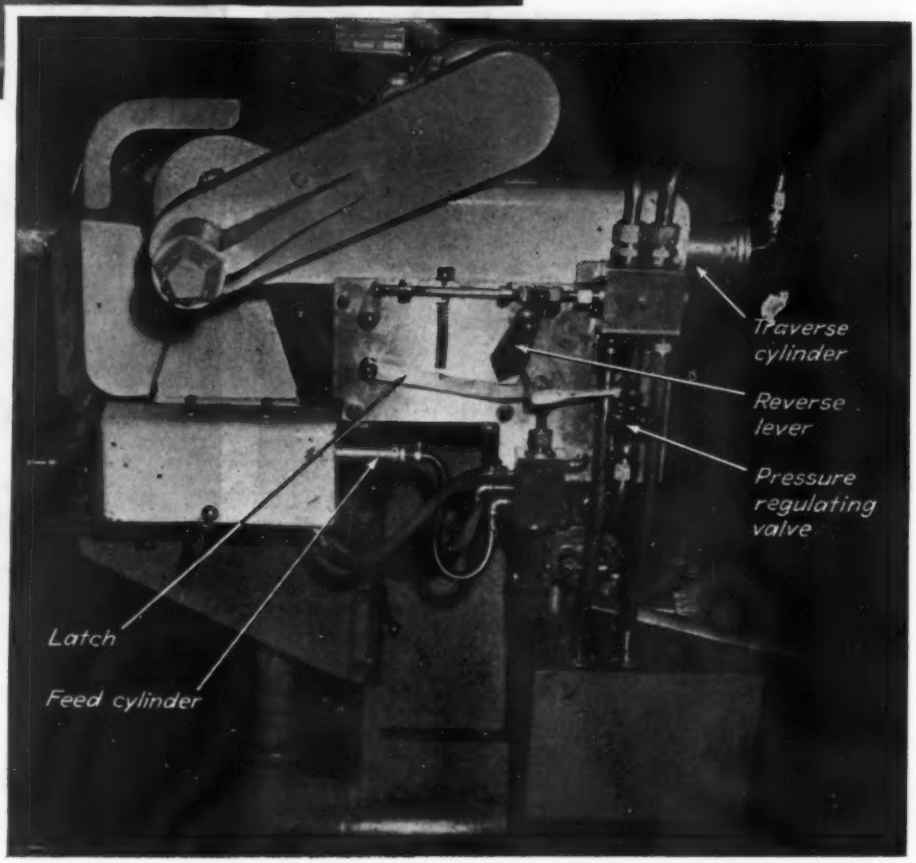
Milling Outer Diameter of Hub. The ball end mill has a 7/16 in. radius to get inside the blade root fillet which varies from 0.85 in. at the back to 0.56 in. at the front of the blade. The cutter rough cuts high enough up on the blades to meet the shaper cuts

Another Set-Up for Milling the Hub. In this case, milling the outer diameter of the hub is done on a Keller Duplicator, the master being mounted above and the workpiece below. The other machine used for this operation is a Cincinnati Hydrotel automatic profile miller. A 7/16 in. radius ball end mill is used

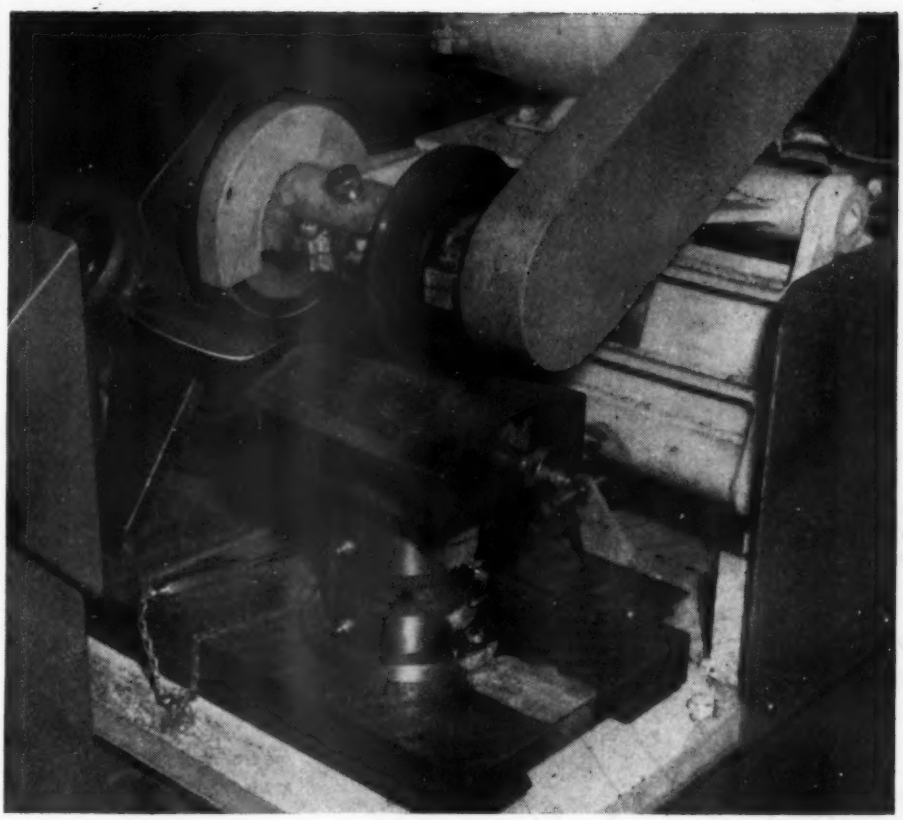
Profiling the Blade Edges. An extension column is provided so as to clear the fixture and blades. A 1-in. end mill, long enough to engage the edge of the blade at all points, is used, permitting a flat master plate. End mill sharpening and final finish allowance are provided for in the diameter of the stylus used against the cam

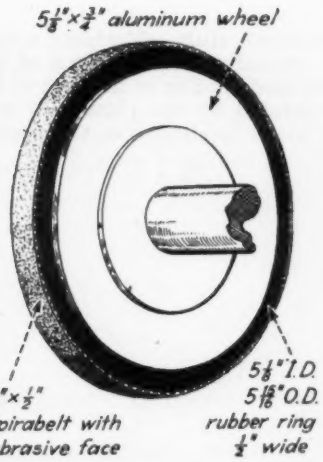


Rough Grinding Front Face. Normal procedure is chipping and filing or grinding and buffing. Since the front face must be fitted to a match block, grinding was selected. Spindle and head of a hand miller were replaced by a carriage attached to bracket on machine column. Carriage has a 3,600-r.p.m. motor driving a grinding spindle by belt. A 6 x ¼-in. wheel is used. The carriage traverses the width of propeller blade at 30 cycles per min., depth of grinding being adjusted by the vertical slide and knee of machine. Propeller design is such that a centerline runs along face of blade through hub axis and along face of opposite blade. So propeller is mounted in an indexing cradle with this centerline at cradle axis of rotation. Thus, when cradle is revolved by stationary plate cam on knee, any part of blade face can be brought to horizontal plane



Another View of Blade Grinder. Since the grinding carriage travels across the blade face in a horizontal plane, a suitable timing combination for table lengthwise feed and rotary motion of cradle will produce the correct blade shape, allowing for some error arising from straight-line travel of the grinding carriage over the curving lines of the blade helices. Here the wheel has just completed a pass, and the reversing valve has been tripped for the hydraulic cross feed. The air valve for the table ratchet feed is interlocked with the reversing valve for the cross feed

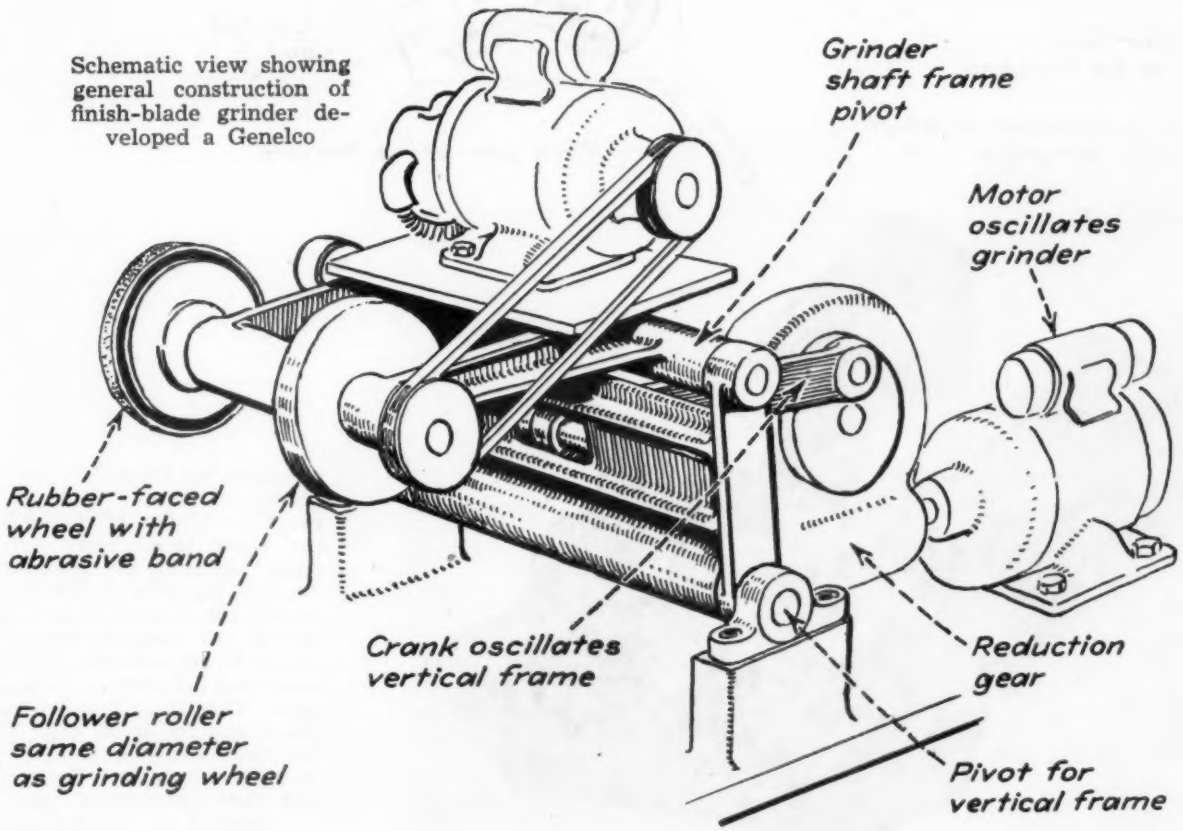




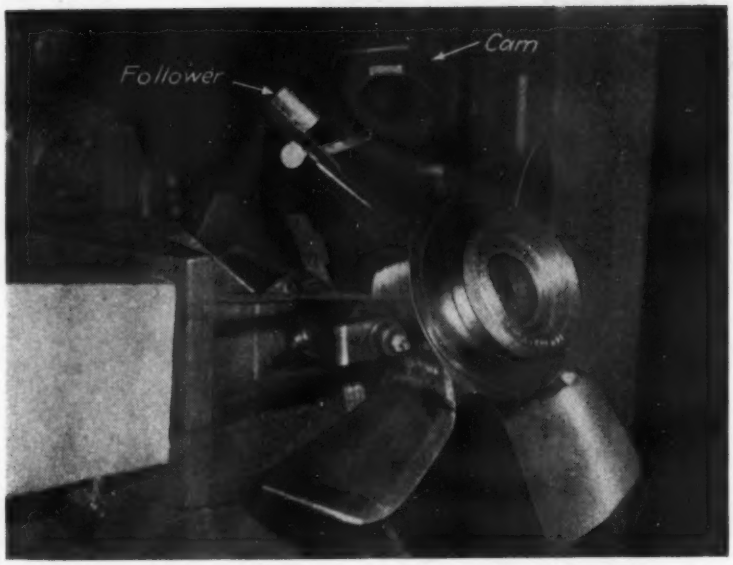
Detail of Rubber Grinding Wheel. This is an aluminum disk with a rubber rim. Wheel speed is 5,000 r.p.m.. Centrifugal force expands the rubber and holds the abrasive belt in place. This construction maintains a uniform diameter grinding wheel so a 6 in. copy wheel and a master block only are required to develop a true contour on blades

Finish Grinding Back of Blade. The rubber-rimmed wheel is faced with an abrasive band. This avoids changes in diameter due to wheel wear, maintains wheel at the same diameter as the copy wheel. The radii on the back of the blade vary over a range of some 4 in. and the blade twists at the same time, so a master block is used to guide the grinding wheel. From 0.010 to 0.020 in. of stock is removed and the average abrasive band is good for two blades. When finish grinding the front face of propeller blades, the master block pedestal is adjusted vertically by a collar, which is graduated in thousandths so that blade dimensions can be controlled

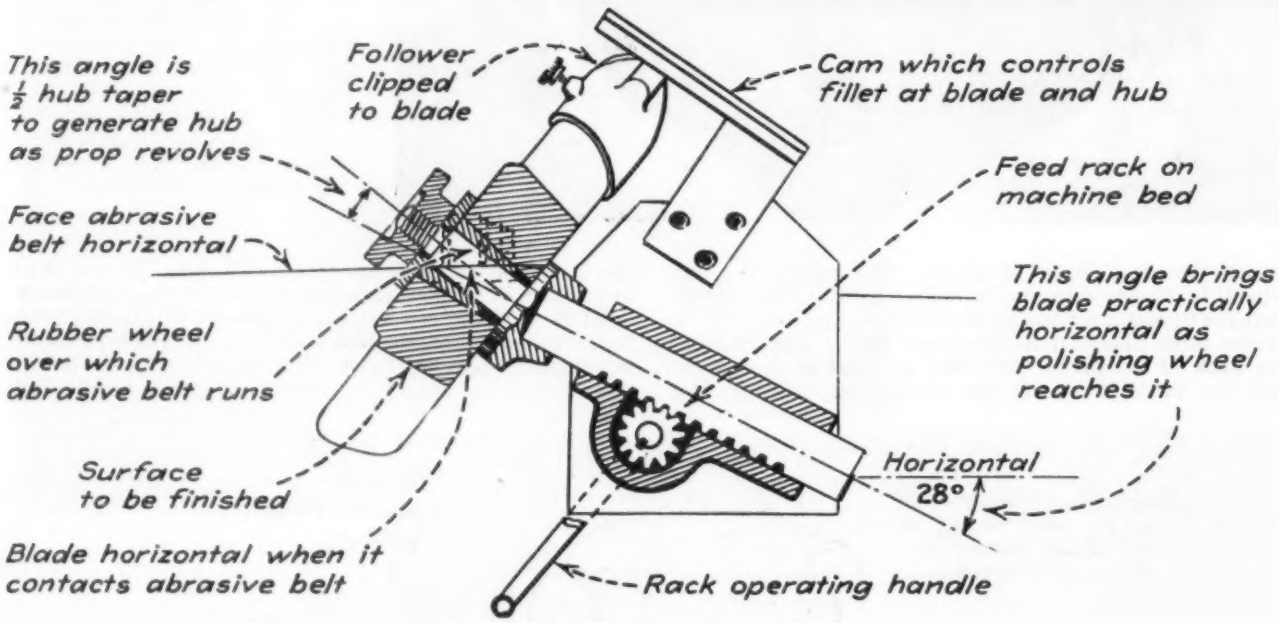
Schematic view showing general construction of finish-blade grinder developed a Genelco

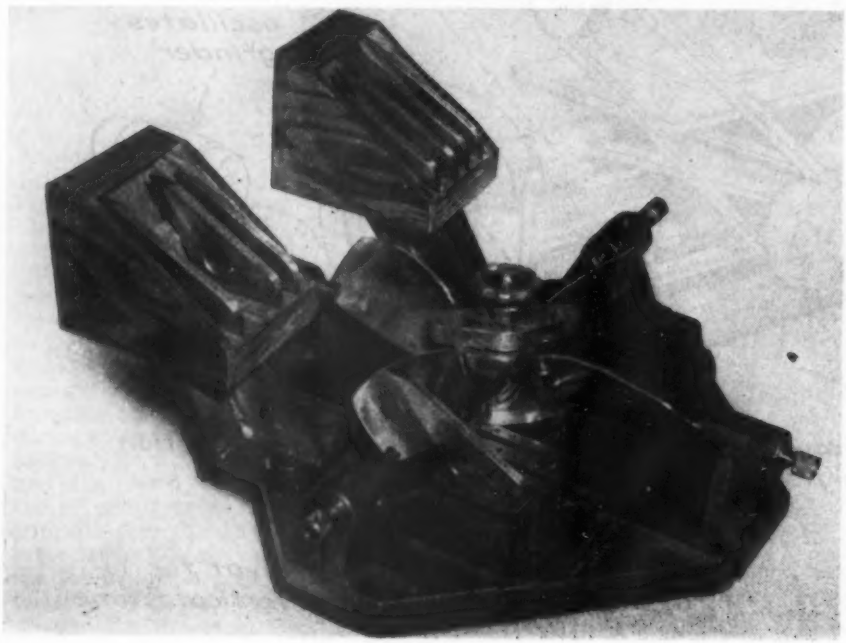

Grinder shaft frame pivot
Motor oscillates grinder
Rubber-faced wheel with abrasive band
Crank oscillates vertical frame
Reduction gear
Follower roller same diameter as grinding wheel
Pivot for vertical frame

Grinding Hub. Machine uses a ¾×48 in. abrasive belt running at 5,000 f.p.m. The large radius at the root of the blade is generated by the plate cam and the follower is clipped to the upper blade



Details of hub grinder showing how a 1.8 in. rubber-faced roller guides the abrasive belt. The method of holding the propeller and roller guide are also indicated


This angle is ½ hub taper to generate hub as prop revolves
Follower clipped to blade
Cam which controls fillet at blade and hub
Feed rack on machine bed
Face abrasive belt horizontal
This angle brings blade practically horizontal as polishing wheel reaches it
Rubber wheel over which abrasive belt runs
Surface to be finished
Horizontal
28°
Blade horizontal when it contacts abrasive belt
Rack operating handle



Checking the Propeller. Bedding blocks are used to check the propeller blades after finishing the front face. They are so close that hand-fitting is rarely needed. No metal has to be removed for balancing, and uniformity of finished weight is said to be remarkable. The final inspection is then made with this gage. The blade position must check exactly at 90 deg. Then four ordinates on each blade are checked for angle. Both right and left propellers can be checked on this fixture

Rigid and Swivel-Type Fixtures Used in Honing Precision Parts

BY W. H. HARRIS, JR., CHIEF ENGINEER, MICROMATIC HONE CORPORATION

Indexing fixtures and provision for automatic positioning and ejection of workpieces speeds the pace of honing operations

HONING TECHNIQUE in horizontal, vertical or angular applications is based on the theory that the honing stones in the hone may be free to align themselves with the neutral axis of the geometric form of the parts to be honed either internally or externally. This permits removal of stock as low as 0.0001 in. on diameter for sizing or clean-up purposes, if necessary, with minimum effort on the operator's part. It is accomplished wherever mechanically possible by universal action in the honing tool itself and by providing a fixture to hold the part rigidly in honing position. In parts having bores which are considered too short in relation to their length to use universal-joint type honing tools satisfactorily, the part itself must be fixtured to provide universal swivel and lateral float and the so-called rigid-joint type hone must be used.

Honing fixtures, therefore, can be classified in two types: (1) Rigid fixtures, as shown in Fig. 1, used in conjunction with universal-joint type hones, and (2) universal swivel and lateral float type fixtures, of the type shown in Fig. 2, used in conjunction with rigid-joint type hones. Any other honing tool and honing fixture combination is a compromise adaptation used only because of me-

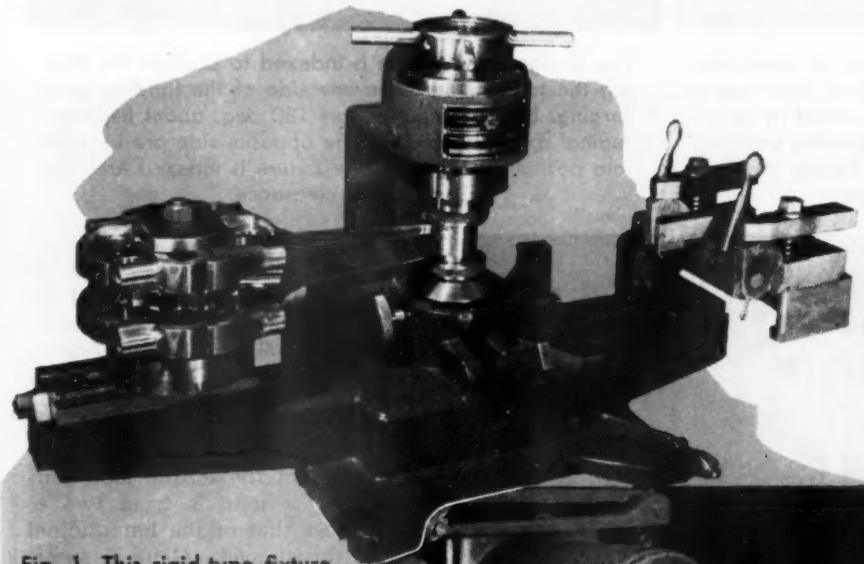


Fig. 1—This rigid-type fixture is designed for honing the piston pin-holes in master and articulated connecting rods for a radial-type aircraft engine. It is used with a universal joint type hone. The smaller articulated rods are clamped in the unit at the right-hand end of the fixture

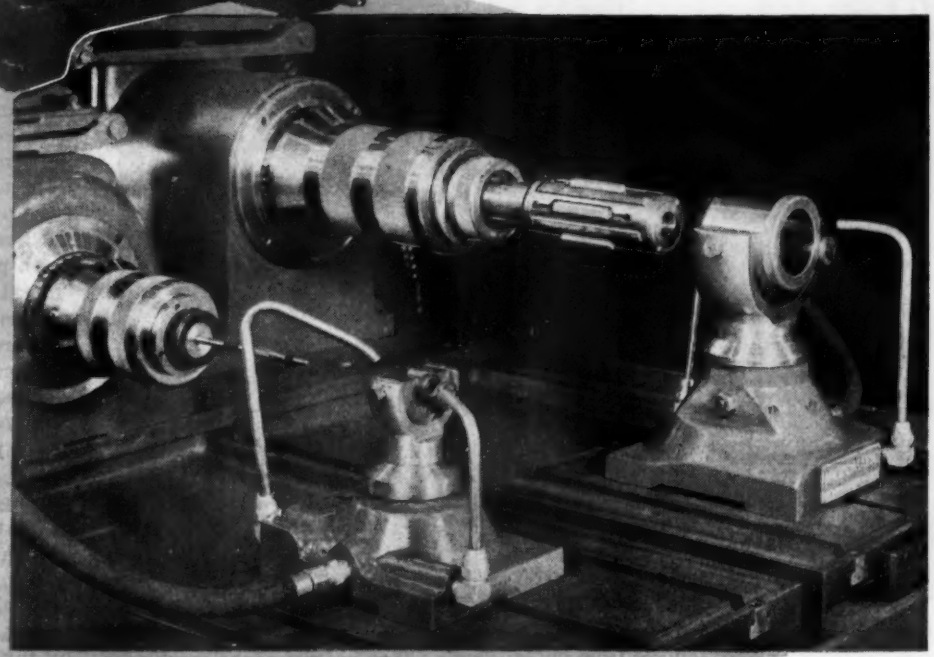


Fig. 2—These two universal swivel and lateral floating type fixtures are used with rigid-joint type hones for finishing the bores of drill bushings. Cutting fluid is pumped under pressure to each end of the bushing

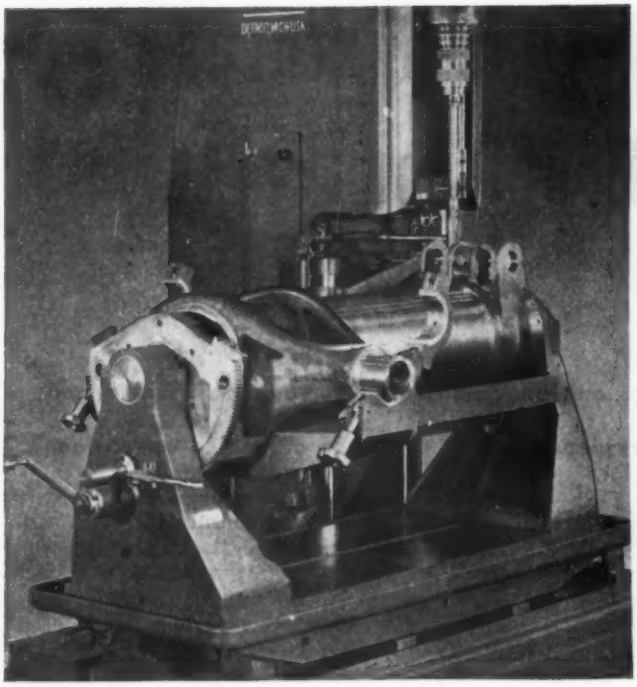


Fig. 3—For honing tandem 1¼-in. bores on each side of a heavy forged steel landing gear part, this fixture is arranged for rotary indexing the part about its longitudinal axis 90 deg. to either side of the loading position, and also for lateral indexing of the fixture itself so the work will clear the hone

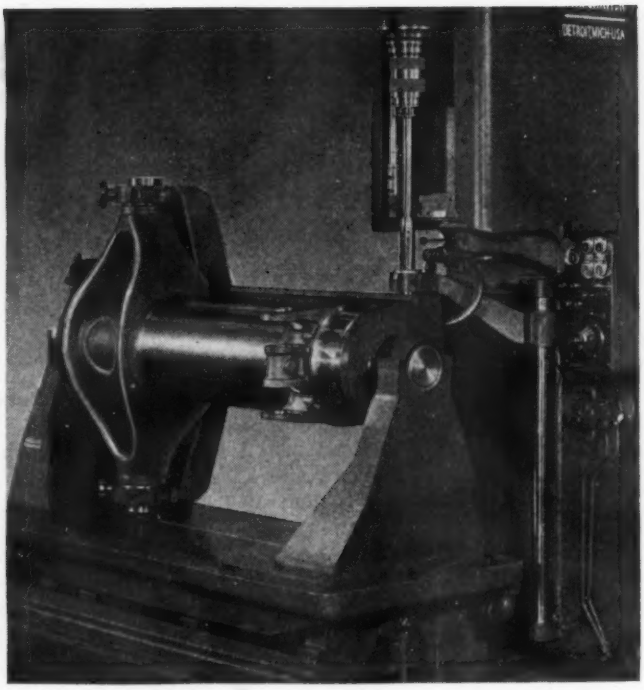


Fig. 4—The same fixture is indexed to position for honing the tandem bores on one side of the landing gear forging. By indexing the part 180 deg. about its longitudinal axis, the bores on the opposite side are brought into position for honing. The fixture is indexed laterally for work clearance

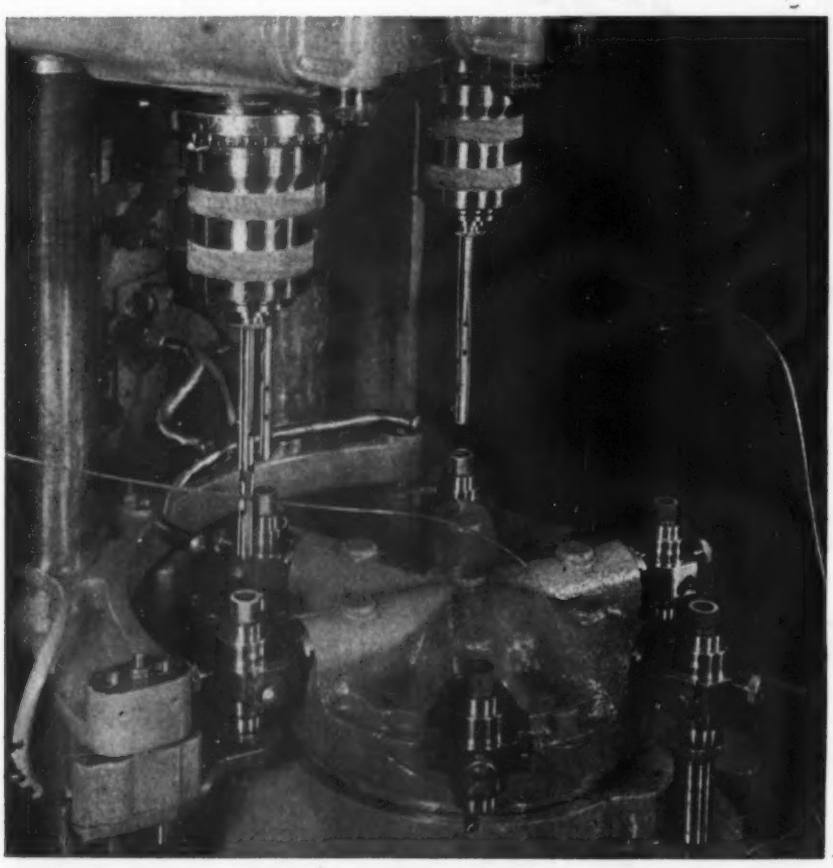


Fig. 5—Automatic rotary indexing of the sub-fixture shown successively carries the work-holding fixtures from the loading position in front of the machine to each of the three rough, semi-finish and finish honing positions for honing the 0.375-in. bores of hardened steel sleeves

chanical design limitations. The degree of accuracy obtainable and the ability to remove relatively large amounts of stock in the honing process can be greatly improved by proper design of the work-holding fixtures.

Fixture design is based on the principle that the torque load generated on a hone is from two to three times that of the longitudinal or end-thrust load. General specifications for either of the two main types of fixture include the use of hardened parts for any part susceptible to wear, and arrangement for easy replacement of such parts. Regardless of size or shape of the work part, clamping must always be "metal to metal." That is, the rest pad and the clamping member must be directly opposed to insure that the accuracies generated by honing will be maintained after the part is removed from the fixture.

For proper location of parts in fixtures, run-out alignment with the honing spindle should be within 0.001 to 0.007 in., depending upon final accuracy required in the part. It is considered a distinct advantage over clamping longitudinally in fixturing, to take the torque—which is by far the greater load requirement—on any projection hole or slot if the part has any of these character-

istics. This is an important point which should be considered, if at all practical, in designing a part for which the honing is contemplated.

In honing many thin-walled parts, such as cylinder sleeves, the part must be allowed to "breathe" radially and longitudinally. This is accomplished by restricting the longitudinal movement between fixed fixture plates with, for example, 0.005 in. clearance, and by taking the torque with one or two individual clamps which can float radially but which are restricted circumferentially and are entirely independent of the longitudinal restricting members. Approximately 0.005 in. on diameter is considered sufficient for radial expansion for "breathing."

Rigid-type fixtures are familiar to most production personnel. This is the type used in nearly every kind of machining operation requiring fixtures. Practically the only difference in honing fixtures is the addition of a guiding bushing over the section to be honed to guide the hone into the work. This guiding bushing often may be more conveniently arranged in a bracket on the honing machine column. Designed for honing piston pinholes in master and articulated connecting rods for a radial-type aircraft engine, the fixture shown in Fig. 1 has a guide or lead-in bushing approximately 0.020 in. larger in inside diameter than the bore of the hole in the part being honed. This bushing is contained within the clamp member supported above the work by a bracket at the rear of the fixture. A clamp for holding articulated connecting rods is located on the right-hand end of this fixture.

Universal swivel and lateral float type fixtures employ an additional technique over and above the locating and clamping means. The members in which the parts are located and clamped are given a universal swivel movement and also a lateral floating movement; no bushing to guide the hone is required as the universal swivel and lateral movements are restricted to some predetermined minimum. This universal swivel and lateral action should be applied at the center of the length of the honed section. The fixture shown in Fig. 2 is made in a number of sizes for honing a range of sizes of hardened steel drill jig bushings. The work-supporting piece in each fixture is interchangeable within the range of the fixture for different outside diameters of bushings. The bushings are merely slipped into place in the U-shaped support blocks and then clamped on one end by a small eccentric washer located in the small moon-shaped counterbore on the end of the drill jig bushing. The torque and end thrust on the bushing is taken by this clamping washer. It will be

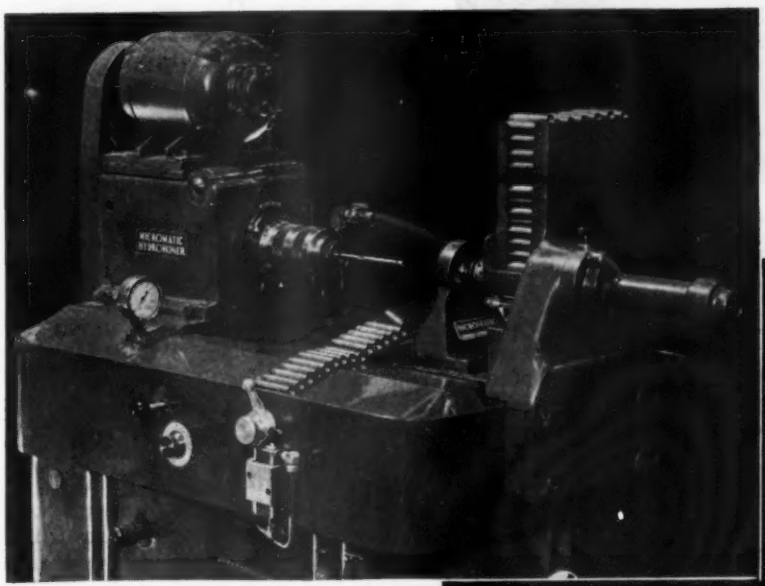


Fig. 6—(Left) Automatic loading and unloading of cast iron automotive engine valve guides permits the production of about 200 pieces per hr. Approximately 0.002 in. of stock is removed on diameter from the 0.332-in. bore of the 3-in. long workpiece

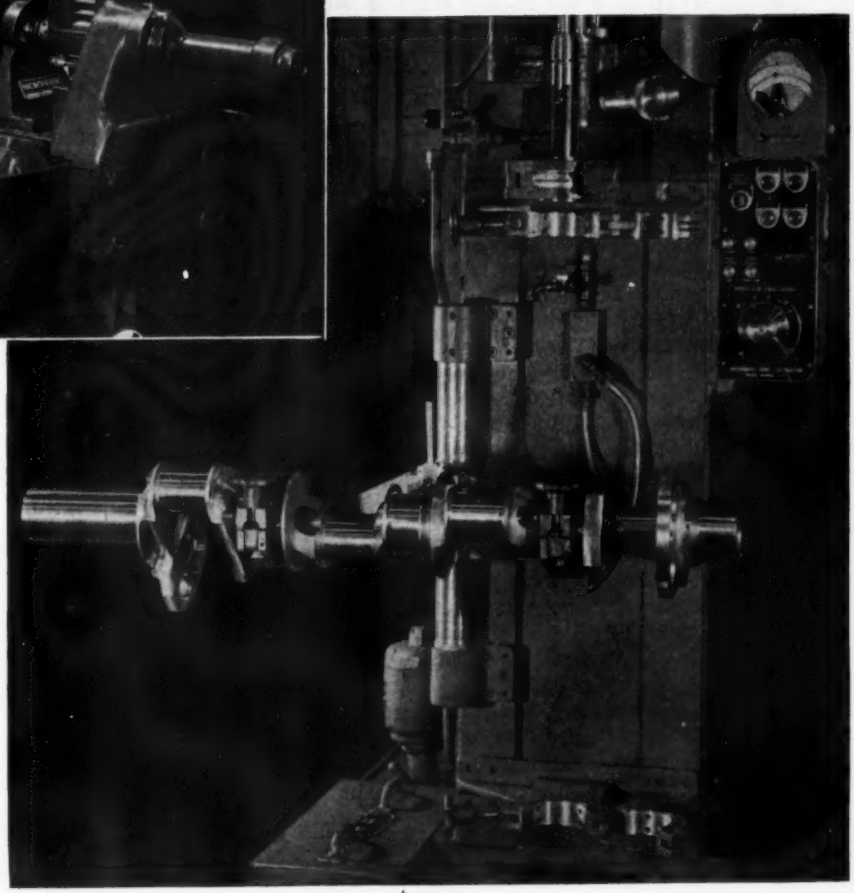


Fig. 7—Angular indexing of the work-holding fixture shown permits handling this crankshaft for an aircraft engine to and from the honing machine by a hoist, since the work is brought to a position in front of the honing tool by indexing the fixture. When setting up for honing, the work is swung manually to a vertical position, then is swung laterally into the two half-round clamp blocks shown on the machine's column

Fig. 8—About 240 gears per hr. can be semi-finish and finish honed in this set-up on a two-spindle machine. Automatic sizing holds the diameter within 0.0003 in. of size

noted that each fixture shown in Fig. 2 is arranged to feed cutting fluid directly to each end of the drill bushing while it is being honed, merely by making one hose connection to the fixture from the supply pump circuit. This simplifies job set-up in the shop.

In addition to locating and clamping a part, consideration should also be given to providing: (a) A means of checking or inspecting the honed section without unclamping or removing the part from the fixture; (b) high production requirements, where a part or parts may be loaded and unloaded while other parts are being honed, and (c) provisions for loading or unloading heavy parts requiring the use of hoists or convenient carriers. This is accomplished by the use of *lateral* (Fig. 3), *rotary* (Fig. 5), or *angular* (Fig. 7) indexing at the fixture itself or by means of a sub-fixture. Wherever practical, automatic loading and unloading of the part may also be considered. Fig. 6 shows a machine arranged for honing the 0.332 in. inside diameter of 3-in. long cast iron automotive engine valve guides with automatic positioning and ejection of the workpieces. Approximately 0.002 in. stock is removed on the diameter from the reamed hole at a production rate of approximately 200 pieces per hr. The fixture is operated by an hydraulic cylinder synchronized with the honing tool hydraulic expansion cycle.

The fixture shown in Fig. 3 provides for rotary indexing of the part 90 deg. each way from the loading position after the large forged steel landing gear member is clamped in position. This fixture is employed for honing the tandem bores 180 deg. apart on either side of the forging. The fixture is arranged for lateral movement on the base of the machine to bring the holes in alignment with the hone after the clamps have been locked and the work has been indexed 90 deg. either way from the position shown. The stop at each end of the indexing gear sector is for approximate positioning prior to insertion of the hardened pin into a bushing in the gear sector. Fig. 4 shows this fixture in position for honing the holes in one side of the workpiece.

The rotary indexing fixture shown in Fig. 5 is arranged for honing the 0.375-in. diameter bores of 2¾-in. long hardened steel sleeves in a three-spindle honing cycle of rough, semi-finish and finish honing. The part is dropped into the fixture at the front of the machine and is located longitudinally within the fixture sleeve by the positive stop shown in front of the fixture at the loading position. This fixture indexes automatically, leaving the operator nothing to do except to remove honed pieces from the fixture and replace them with other parts as the individual fixtures pass the loading station.

In Fig. 7 is shown an angular indexing fixture designed for honing the inside diameter of five main crankshaft bearing journals, with the hone positioned by automatic skip stops provided at the side of the machine. This part is loaded in position as shown in Fig. 7, then rotary indexed manually to a vertical position and swung laterally into honing position where it is accurately located and clamped on the two half-round blocks, top and bottom. With this fixture, the part can be loaded and unloaded with a hoist as the loading position is forward from the honing spindle.

Many parts, such as gears, fuel injector barrels and parts of odd external shapes are fixtured by a method wherein the part is located in a "nest" and not clamped—the torque being taken by suitable means in the "nest" itself. Bearing sleeves and other symmetrical shaped parts are located similarly but are clamped by a single point or line contact self-locking clamp; pressure is applied by the proper directional rotation given to the parts by the hone. These latter two methods of fixturing increase the speed considerably in loading and unloading.

On high production two- or three-spindle honing machines a production of approximately 260 parts per hour has been attained even without automatic loading and unloading type fixtures. The latter, if used on a specific job, would not materially increase the production but would minimize the burden on the operator. In Fig. 8 is shown such a set-up for honing the ½ in. inside diameter of small gears, removing 0.002 to 0.003 in. stock on diameter and producing an 8- to 15-microinch finish with automatic sizing within 0.0003 in. for diameter size.

Practical Ideas

★ **War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production** ★

Gage Permits Quick Set-Up Regardless of Drill Length

BY FRED KRIEWALL
Packard Motor Company

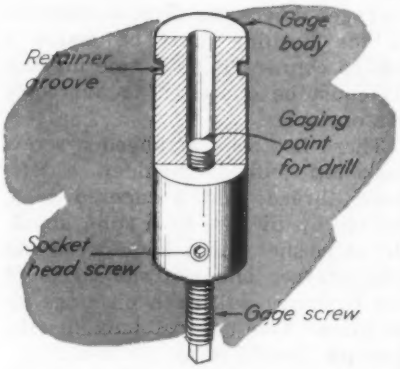


Fig. 1—Steel gage body has a retainer groove for location in the fixture

Where many pieces are to be drilled to a fixed depth, it is necessary to change drills frequently. It is seldom that re-sharpened drills are of the same length, so the customary trial and error method is used to gage the depth of the hole for each drill and set the drill spindle stops; all of which consumes much time.

A better method is to set the drill to a gage which fits the drill bushing hole. This gage has a groove near its top to fit a forked retainer. An axial hole is drilled large enough to accommodate the deep-hole drill, and a tapped hole carries a setscrew locked in position by a socket-head screw. This gage establishes a constant distance from the drill point to the bottom of the hole.

To use this gage, the drill bushing is removed from the fixture, the gage is put into this hole and the retainer is placed in the gage groove. The drill point is seated on the setscrew, then the drillhead is adjusted. The retainer is removed, the drill gage taken out, and the drill bushing replaced. A hole is drilled to the correct depth and the spindle stops set. Once the stops are correct, either the table position or the drillhead may be changed to compensate for drill length differences.

The time savings amount to about four minutes per change for each spindle, which adds up to an appreciable amount in a year. Scrap, due to over or under drilling, is eliminated.

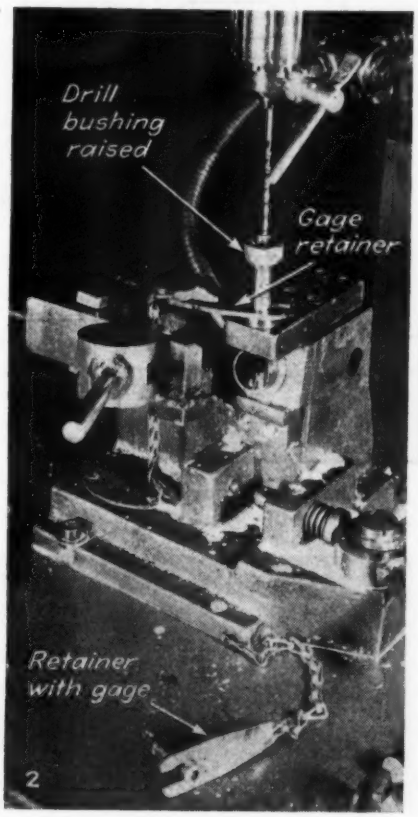
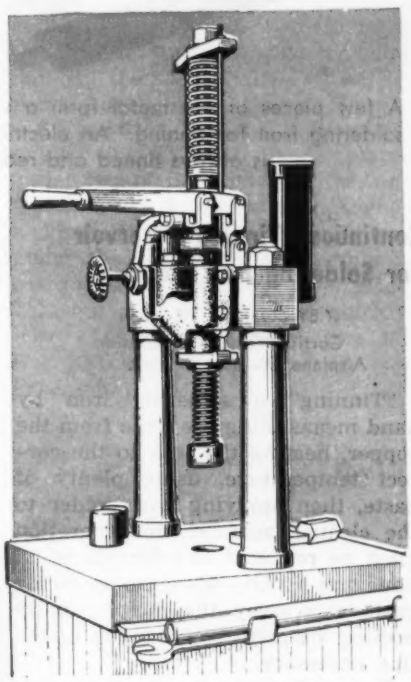


Fig. 2—Drill bushing is out of the fixture and the gage held in position by its forked retainer



An ordinary hand-operated hydraulic press is utilized to the limit by adding a screw to the ram

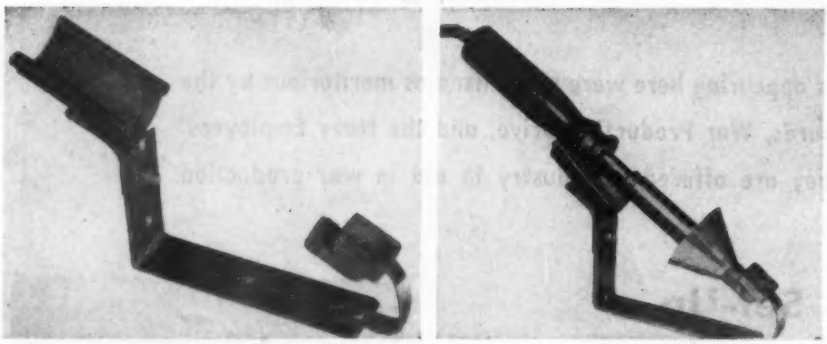
Adjusting Screw in Ram of Hydraulic Press Avoids Blocking

S. W. HOWELL

Where a variety of sizes of pieces must pass over the platen of an hydraulic press, it is impractical for a fixed length ram to adapt itself to all conditions, so blocking becomes necessary. Loose pieces prove to be very unsatisfactory, because of their instability and the danger of injuring operators.

To avoid blocking-up, the ram is drilled and tapped for as large a diameter thread as it will take safely. Then a screw, similar to a screw jack, is turned into it; the side of the head of this screw is roughened by weld spots for easy adjustment.

This method increases the range of a useful press, without the annoyance of making a set-up for pressing many sizes of bushings and shafts into position.



A few pieces of flat metal form a very convenient means of holding the soldering iron for tinning. An electric iron, with its tip resting in the well, is always tinned and ready for immediate service

Continuous Tinning Reservoir For Soldering Iron Stand

BY JOHN B. BROWN
Curtiss-Wright Corporation
Airplane Division, Columbus, O.

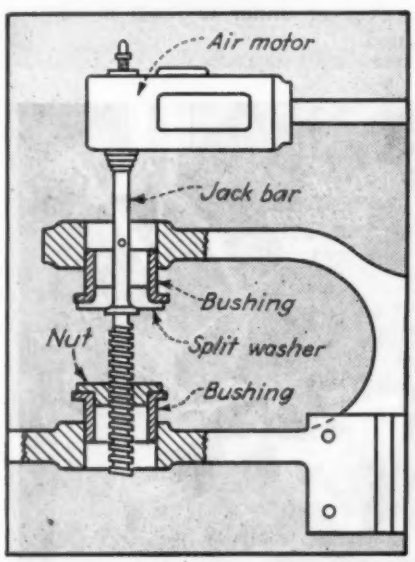
"Tinning" a soldering iron by hand means filing the scale from the copper, heating the iron to the correct temperature, using plenty of paste, then applying wire solder to the cleaned surface; this operation must be repeated at intervals of an hour and a half. Also, the soldering paste eats away the metal rapidly making frequent replacement of the tips necessary.

The soldering iron stand consists of a bracket, inclined at 30 deg., with a semi-circular rest at one end for the handle and an elbow fastened at the other. This elbow is the reservoir into which the soldering iron dips; for convenience of positioning the tip, a funnel is attached to the pipe elbow. The elbow may be a pipe fitting or a piece of bent tubing, and the length should be sufficient to cover at least one and a half inches from the tip with solder; filling is accomplished by feeding wire solder into the elbow.

The soldering iron (100 watt, ⅜-in. diameter) is brought to operating temperature and the tip placed in the reservoir or solder well: wire solder is inserted into the opening of the well and melted until liquid solder covers the shank of the tip to about one and a half or two inches from the point. This protective coating is renewed each time the iron is placed in the stand and the coating of solder does not build up, because the film clings only to the copper. This continuous coating retards pitting or oxidation and the "tinned" tip will remain in good condition for long periods of time.

The savings due to this stand show a life of the soldering tip of four times the hand tinning, a large amount of soldering paste, plenty of wire solder, and almost complete elimination of dressing.

This surprising success is due to constant tinning of the hot tip which retards pitting due to soldering paste and prevents oxidation accelerated by heat. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Bushing screw jack in position

Bushing Screw Jack Useful for Pressing Bearings Into Position

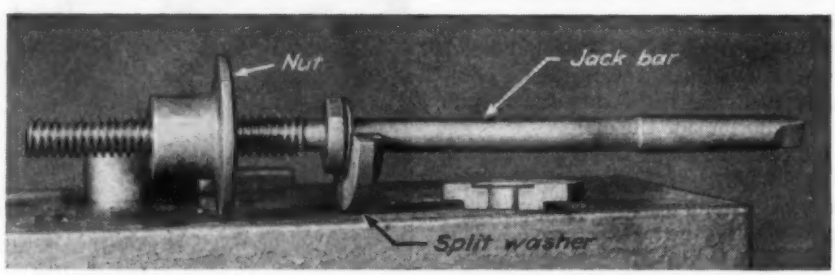
BY H. W. SHEPHERD

There are many instances where bushings must be pressed into position but the shape of the piece does not allow space for a hydraulic press to operate. Locomotive, steam and oil engine construction have linkages where the largest diameter of the bushing must be inside a forked connection. So some ingenuity must be exercised to overcome the obstacle.

There has been arranged a screw jack bar with a shoulder, a left-hand thread, and a tapered tang, which, by the use of a split, shouldered washer and a shouldered nut (the washer and nut shaped to fit the bushing) will push bushings into place. The tapered tang fits the driving spindle of an air motor.

Preparation for pressing the bushing into place is as follows: the top bushing is placed in position, the screw jack bar is placed in the hole, the nut is run up the bar as far as possible, and the lower bushing is put in place. The bar is lowered so that the shouldered nut is inside the lower bushing, at which time the split washer is placed under the top bushing.

To force the bushings into position, an air motor is connected to the tapered end of the bar and compressed air is turned on. If one bushing goes home ahead of the other, the screw continues to turn until both bushings are solidly in position.



The assembled bushing screw jack shows the jack bar with one piece of the split nut on the platen of the press, and the other piece on the screw; the nut is on the threaded end

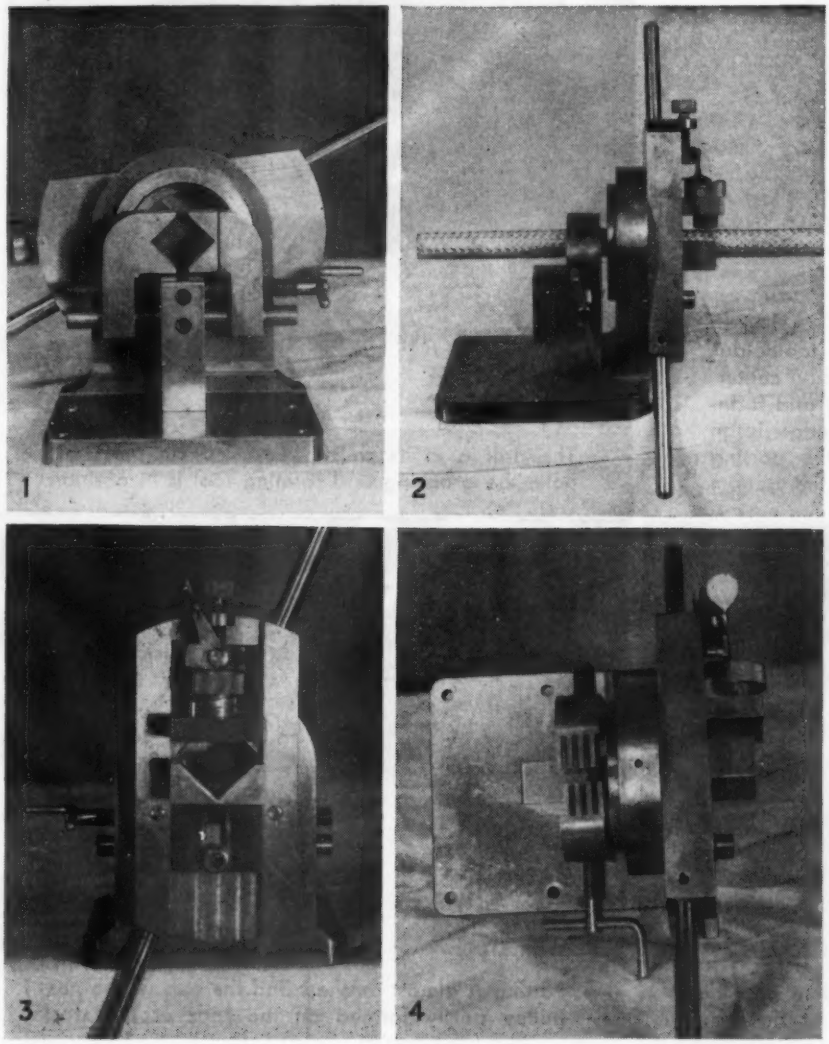


Fig. 1—Back view shows the jaws and the screw for gripping cable. Fig. 2—The cable is gripped in the vise ready for stripping. Fig. 3—Rotating slide, with handles, shows latch for pressing the knife into the wire mesh and the adjusting screw on top. Fig. 4—Top elevation indicates the vise on the left for gripping the cable and on the right the rotary slide which carries the adjustable knife

Bench Tool Strips Armor From Electric Cable

BY C. W. SCHWARZ
Washington Navy Yard

Armored electric cable, with woven wire protection, is troublesome with respect to severing the wire shield square and clean without cutting the worker's hands or consuming too much time. Hacksaws, knives, and other means have given unsatisfactory results.

An answer was found by designing a simple bench tool which grips the cable, cuts the armor, and removes the covering.

The tool is similar to a pipe vise with a knife, supported by a slide, mounted on the front. The slide can be rotated through a full circle by handles and the knife can be adjusted to cut through the armor. At the back of the tool are jaws for gripping the cable.

The stripper operates this way. The cable is slipped through the tool to a distance decided upon, the vise tightened firmly, then the knife is adjusted to cut the armor. Two handles are used to rotate the slide through a full circle to make a clean cut of all the wires. A sharp pull on the cable strips the armor.

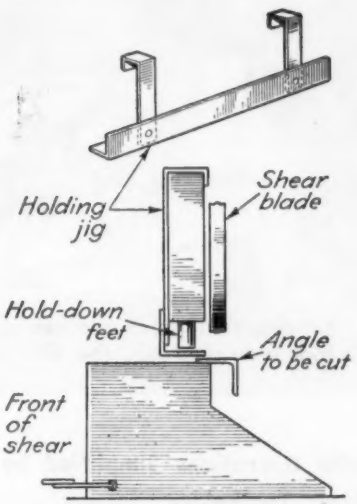
This tool eliminates accidents and makes a good job in a fourth of the time required by hand. *Suggestion submitted under the Navy Employees' Suggestion Program.*

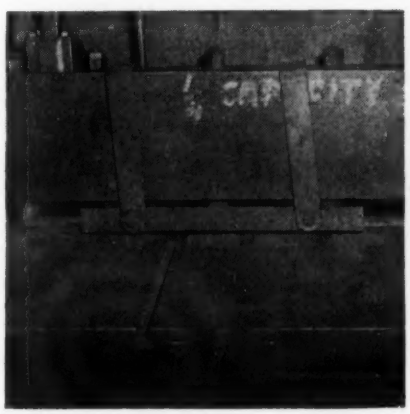
Angle Clipping Jig for Shear Increases Output and Safety

BY E. GUTIERREZ
California Shipbuilding Corporation

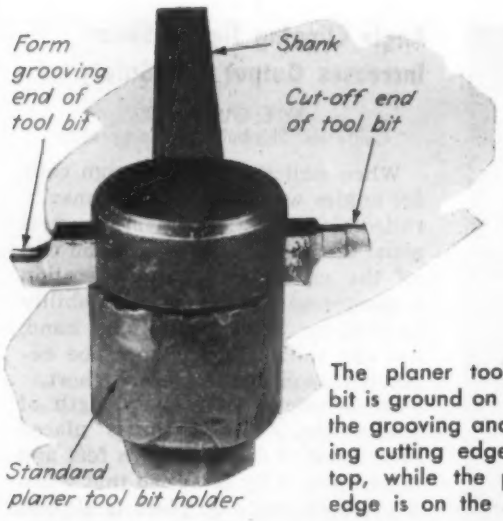
When structural steel design calls for angles with legs not customarily rolled, or a size not in stock, it is usual to take a larger angle and clip off the excess. Such an operation is dangerous, because of the inability to hold the angle securely by hand, nor can the shear holddown be depended upon, if the piece is short.

As a safety feature, a length of angle, say 3×3×22 in. is placed under two of the holddown feet and fastened to it by straps so that when a piece of angle or plate is slipped under the knife it is held firmly in position while shearing takes place. This jig can be removed quickly. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

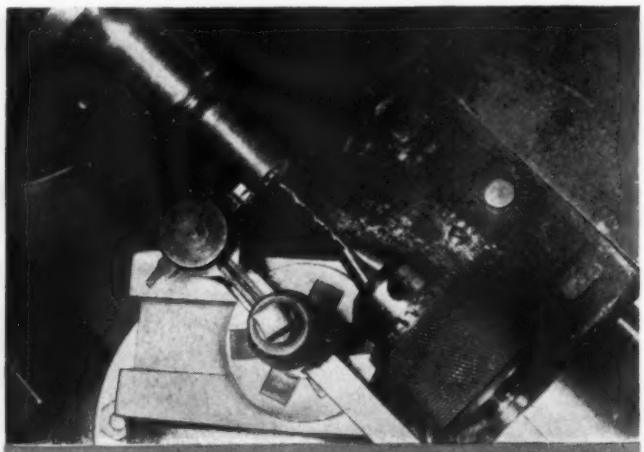




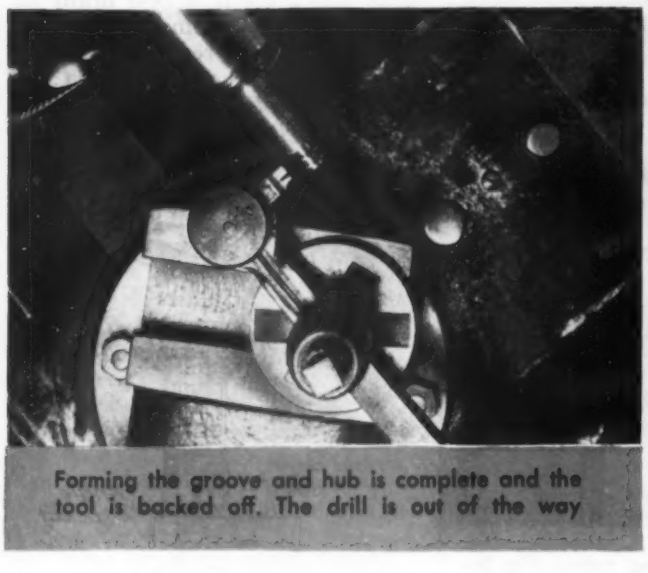
Use of a short length of angle fastened to the holddown makes shearing small pieces of angle or plate a safe operation



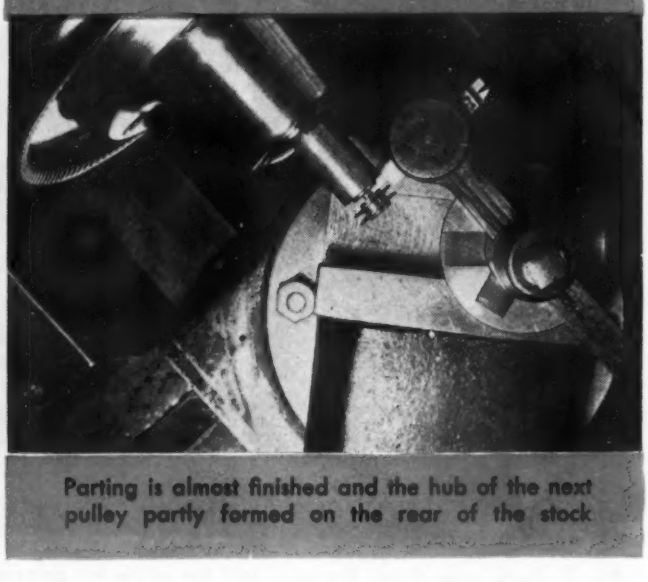
The planer toolholder bit is ground on center, the grooving and forming cutting edge is on top, while the parting edge is on the bottom



The drill is in its chuck, ready to cut the shaft hole, the grooving and forming tool is in position



Forming the groove and hub is complete and the tool is backed off. The drill is out of the way



Parting is almost finished and the hub of the next pulley partly formed on the rear of the stock

Lathe Operations Simplified by Planer Toolholder

BY CREIGHTON TAYLOR

Single-purpose machines can be adapted to do a multiplicity of operations by the use of additional tools, extra fixtures and other means.

The customary lathe toolholder carries one cutting edge, the planer toolholder is arranged to carry a toolbit, which can, on occasion, be ground to cut on both ends. An application to a lathe of a planer tool, using both cutting edges, has been found useful.

Small aluminum pulleys were to be turned from bar stock; the operations consisted of drilling the shaft hole, turning the hubs, grooving the face, and cutting off. These operations were too few and simple to require an automatic lathe, so an engine lathe equipped with a planer toolholder was chosen.

The toolbit was ground on center, as follows: one end was shaped to form the groove and hub, the cutting edge being on top of the bit; the other end was a plain cut-off tool with its cutting edge on the bottom of the bit. For forming the hub, the width of the cutting edge was made twice the hub length plus the width of the parting tool.

Mounting this planer tool meant removing the toolpost rocker and using a shim to bring the cutting edges on center. The shaft hole was drilled by mounting a drill chuck in the tailstock spindle and feeding it in.

Sequence of operations follows: feed the bar stock to the necessary length, drill the shaft hole and back out the drill; feed the grooving and hub forming tool into the stock, then back out; run the toolslide across the bed and bring the cut-off tool into operation from the far side. Repetition of dimensions can be controlled by stops on the bed and toolslide.

Bakelite Headed Metal Studs Deburred by Tumbling

BY JAMES W. HELLINGS
Radio Corporation of America, Camden

After plastic has been molded to a metal stud, there is a flash at the stud end of the head. Hand cleaning consisted of holding the part against a wire brush, much care being necessary to avoid surface scratches, besides considerable time was consumed with this operation. Attempts to tumble this piece only

made matters worse, because the stud scratched the surface.

It was found that if varnished fabric tubing, popularly called "spaghetti", was slipped over the studs before tumbling, the threads would be masked, thus preventing contact between the plastic and metal. The result was the removal of the flash in a short time instead of the long hand operation. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Pipe-Slotting Attachment for Milling Machine

BY FRED WEBER
Mare Island Navy Yard

Slotting pipe up to 2-in. iron pipe size and any length has been a problem in many shops, especially when long pieces are to be cut. Very few milling machines have beds capable of cutting customary lengths, and setting up a planer takes out of production an expensive piece of equipment without counting the difficulty of holding the pipe in position.

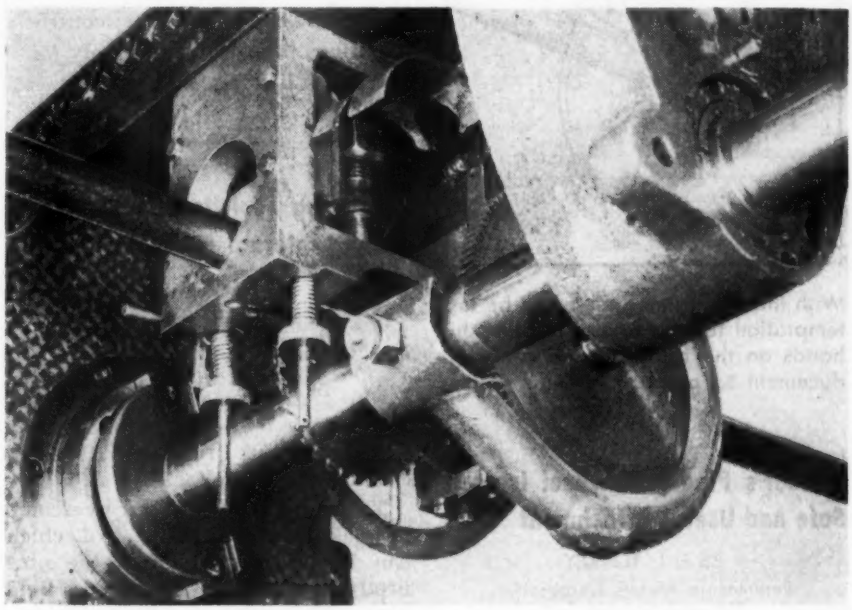
To produce large quantities of slotted pipe, a milling machine was utilized by attaching a fixture to the overarm. This fixture combines holding the pipe in position as well as feeding it into the slotting saw.

The fixture is composed of welded shapes clamped to the dovetail of the overarm. On each side of the fixture frame are ways carrying spring-loaded rollers bearing against the top of the pipe; a fluted cylindrical roller is in direct contact with the bottom of the pipe. The bottom roller has a 110-tooth, 16 D.P. gear on its shaft driven by a 20-tooth pinion on the milling cutter arbor. The slot is cut with a 4-in. saw. The pipe is guided through the machine by V's in the end frames.

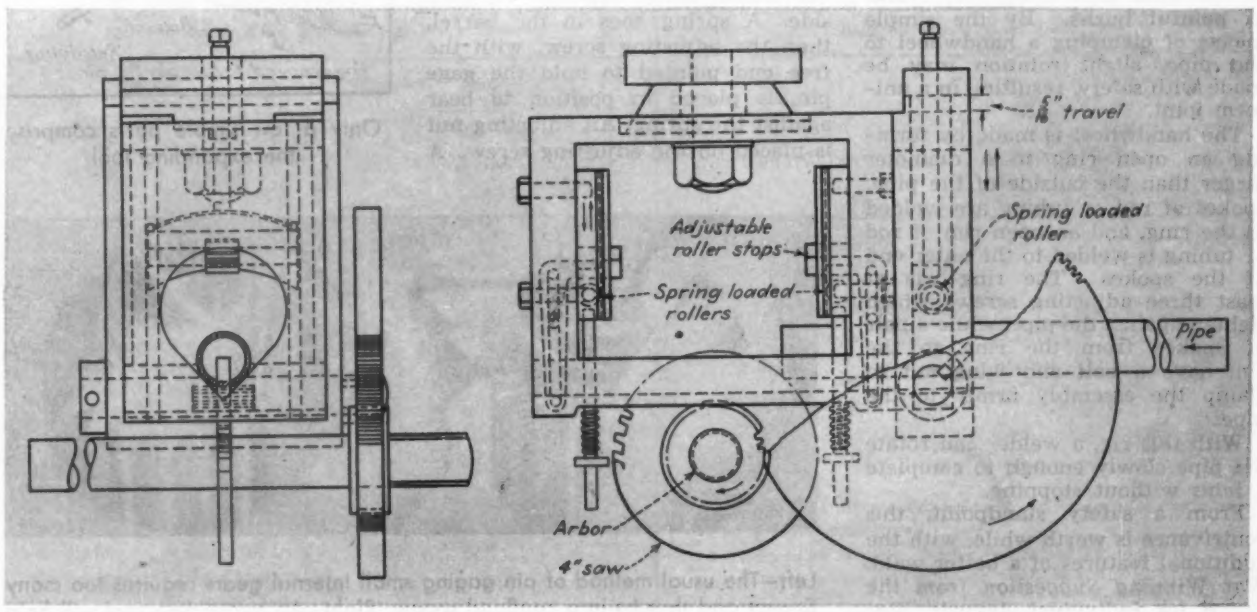
Saw rotation at 125 r.p.m. results in a feed rate of 60 in. per min. The saw cuts downward, thus holding the pipe firmly in the V-guides in the frame.

No set-up time is required, nor is a skilled operator necessary, it is simply a case of placing the pipe in position and letting the machine take care of itself. The coolant does not enter the pipe, nor does it spill on the floor.

Depending upon the size of the pipe handled, the production is from

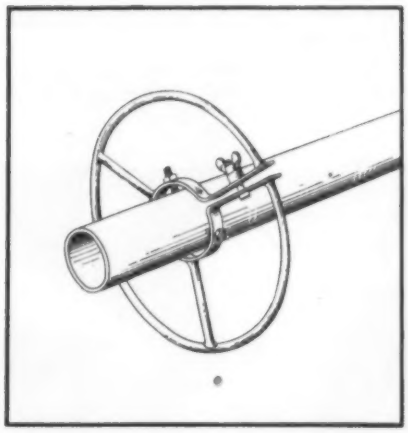


Slotted pipe leaves the fixture guided by the end frame V. The lifted gear guard shows the gear driving the fluted feed roller contacting the pipe



The arrangement is compact enough to be removed quickly. The saw and pinion are taken out as one piece

four to twenty-five times faster than customary and the length is restricted only by the method of supporting the pipe into and out of the machine. *Suggestion submitted under the Navy Employees' Suggestion Program.*



With this handwheel, there will be less temptation for the welder to place his hands on the hot pipe and every inducement to produce a uniform joint

Welder's Pipe Handwheel is a Safe and Useful Attachment

BY F. L. TORREY
Permanente Metals Corporation
Shipyard Number Two

Under many conditions, welding pieces of pipe together is an awkward operation. Turning the pipe, as the weld progresses, may result in painful burns. By the simple means of clamping a handwheel to the pipe, slight rotation may be made with safety, resulting in a uniform joint.

The handwheel is made by forming an open ring to a diameter larger than the outside of the pipe; spokes of rod or tubing are welded to the ring, and an open rim of rod or tubing is welded to the outer end of the spokes. The ring has at least three adjusting screws which tighten against the pipe, while a pair of spokes from the ring to the rim have a bolt and wing nut to clamp the assembly firmly to the pipe.

With this rig, a welder can rotate the pipe slowly enough to complete a joint without stopping.

From a safety standpoint, this contrivance is worth while, with the additional features of a better weld. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Have You a Practical Idea?

. . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. Thus the plowback of experience will promote progress and prevent repetition of past errors. But be certain your idea is really practical—no day dreams or untried whimsies are wanted. We pay for contributions prepared exclusively for this publication.

Expanding Tool Holds Pins for Gaging Internal Gears

BY A. G. BARNES
Aircraft Engine Division
Packard Motor Car Company

Pin gaging small internal gears has been a four-handed affair with very doubtful results. Repeated checks were unreliable.

This nuisance has been overcome by making an expanding tool which can be tightened to hold the pins firmly in place. With rigidly held pins, micrometer readings become dependable and can be repeated.

A barrel, with one end shaped to hold the gage pin, has a short slot cut diametrically opposite on each side. A spring goes in the barrel, then the adjusting screw, with the free end pointed to hold the gage pin, is placed in position to bear against the spring. An adjusting nut is placed on the adjusting screw. A small pin holds the adjusting screw in the barrel.

Gaging is simply a case of placing the pins in position, putting the expanding tool between the gage pins and tightening the adjusting nut on its screw.

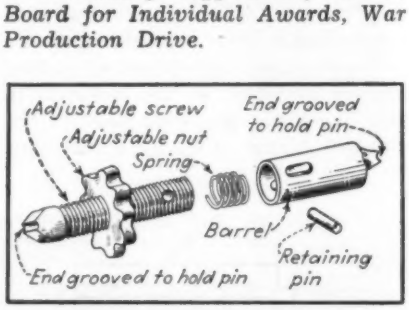
The time saved amounts to about 2000 man-hours a year, and the correctness of measurement is beyond dispute. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Mechanic's Squares Refinished to Restore Calibration Visibility

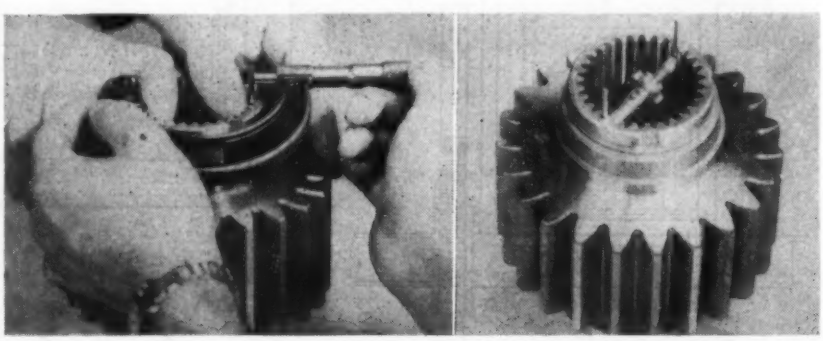
BY THOMAS HOLLEY
Kaiser Company, Inc.
Vancouver, Washington

After many years of use, the graduations and figures on the face of a square become so indistinct they cannot be read.

To extend the usefulness of a square, the faces are cleaned with a wire brush and polished, then a coat of aluminum paint is applied. Before the paint has an opportunity to dry, it should be rubbed off. The paint remains in the crevices and makes the calibrations like new. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Only a few simple parts comprise the expanding tool



Left—The usual method of pin gaging small internal gears requires too many fingers and thumbs in a confined space. Right—An expanding tool will hold the pins in place much more conveniently

AMERICAN MACHINIST REFERENCE BOOK SHEET

Lubrication of Gearing—I

A TENTATIVE STANDARD ISSUED BY THE AMERICAN GEAR MANUFACTURERS ASSOCIATION

GENERAL

1. This standard covers the method of lubricating and the type and grade of oil to be used in inclosed gear drives and open gearing. It is applicable to the following types of gearing:

Helical	Straight Bevel
Herringbone	Spiral Bevel
Hypoid	Spur
Worm	

These specifications apply only when the gears are designed and rated in accordance with AGMA standards. The ambient temperature range for which they apply is from 0 to 150 F. Gear drives operating outside of this range or those operating in extremely humid or chemical-laden atmospheres should be referred to the manufacturer.

Lubrication of Gear Teeth

The areas of contact on gear teeth are relatively small and the unit pressures produced in transmitting the loads are relatively high. It is therefore essential to provide a film of lubricant of sufficient strength to withstand the localized pressure during the period of contact. The peripheral speed of the gears governs the period of tooth contact and determines the length of time the film must withstand the pressures. When speeds are high, the time is very short and the loads are usually light and as a result an oil of comparatively low viscosity should be used. When speeds are low and the loads heavy, the contact time is considerably longer and an oil of higher viscosity should be used.

Temperature

1. The ambient temperature, which is here defined as the temperature of the air in the vicinity of the gears or gear unit, has considerable bearing on the viscosity of oil to be used. In general, the viscosity of mineral oil varies inversely with the temperature, which fact makes it desirable to use an oil of heavier grade at high ambient temperatures than would be used for the same application operating in a low ambient temperature. Also, for low temperatures an oil must be selected which has a pour point lower than the minimum temperature expected for the application.

2. Where the operating temperature for any one application varies more than 80 F., a viscosity index (Dean and Davis) of 60 minimum is desirable. For ordinary applications, a viscosity index of 20 minimum is satisfactory.

Type of Oil

1. Lubricating oils for use with gears and gear units should be high grade, high-quality, well refined petroleum oils. They must not be corrosive to gears, or to ball, roller or sleeve bearings; they must be neutral in reaction; free from grit.

2. Lubricants of the straight mineral type are to be used for all except worm and hypoid gears. For worm gears, additions of 3 to 10 percent of acidless tallow or similar animal fats are desirable. For hypoid gears, an acceptable grade of extreme-pressure lubricant is used.

The viscosity range for the various AGMA lubricants is shown in Table I. The oils specified by number for the various types of gearing and ambient temperatures must be within this viscosity range.

Table I—Viscosity Range For Various AGMA Lubricants

AGMA Lubricant No.	Viscosity Range S.U.V. Seconds	
	At 100 F.	At 210 F.
1	180 to 240	——
2	280 to 360	——
3	490 to 700	——
4	700 to 1,000	——
5	——	80 to 105
6	——	105 to 125
7	——	125 to 150
7 Comp.*	——	125 to 150
8	——	150 to 190
8 Comp.*	——	150 to 190
9	——	350 to 550
10	——	900 to 1,200
11	——	1,800 to 2,500

*The oils marked "Comp." are those compounded with 3 to 10 percent of acidless tallow or other suitable animal fat.

Oils No. 9, 10 and 11 should be of a tacky adhesive nature so that they will adhere well to the tooth surfaces.

Table II—Recommended Lubricants for Inclosed Units of All Types Except Worm Gears

Type of Units	Size of Units	Ambient Temperature, F. 0-40 AGMA No.	41-100 AGMA No.	101-150 AGMA No.
Parallel shaft	Low-speed, centers up to 20 in.	2	4	5
	Low-speed, centers over 20 in.	3	5	6
Planetary gear	O. D. of housing up to 16 in.	2	3	4
	O. D. of housing over 16 in.	3	4	5
Gearmotors	All sizes	2	4	5
Spiral or straight bevel gear	Cone distance up to 12 in.	2	4	5
	Cone distance over 12 in.	3	5	6
High-speed	All sizes	1	2	3

Table III—Recommended Lubricants for Inclosed Worm Gear Units Only

Service and Worm Speed	Ambient Temperature, F. 0-40 AGMA No.	41-90 AGMA No.	91-120 AGMA No.
Intermittent operation *All worm speeds	5	5	7 Comp.
Continuous operation. Worm speeds below 600 r.p.m.	7 Comp. **Diluted	8 Comp.	8 Comp.
Continuous operation. Worm speeds 600 r.p.m. and over	7 Comp. **Diluted	7 Comp.	8 Comp.

*Where period of operation is insufficient to produce any appreciable rise in oil bath temperature.

**Diluted AGMA No. 7 comp. oil should be diluted with a lighter oil, preferably not exceeding 500 sec. viscosity at 100 F., until the desired fluidity is obtained. The lubricant used for dilution should be of the same basic crude as that of the recommended oil. The lubricant supplier should be consulted if there is any doubt.

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● In Webber Standard Gage Block Sets you get a wide working range with gage blocks made within 4 millionths of an inch accuracy. Webber Sets permit 250,000 measurements as compared to the average 125,000. This is made possible by the .10005 inch block included in all 84 and 43 block sets. Another advantage is the two wear blocks also included in these sets for use where blocks come into contact with the work. Dimensional accuracy—Stability—Surface Finish—Wearing Quality are inherent features of all Webber Gage Blocks.

Webber Heavy Duty gage blocks are practical, accurate measuring tools which may be quickly assembled into a precision Height Gage—an inside or outside Caliper or Divider. These extra large gage blocks with generous wearing surfaces all with accuracies within millionths of an inch bring the tool maker new precision in layout and inspection work. Note all 6 inch heavy duty blocks have walnut insulation strips to keep heat of hands from the gage itself.

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Set No. 84A . . $350.00 **Set No. 43A . . $185.00**
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Set No. 38A (Thin Blocks) . . . $195.00
Set No. 38B (Thin Blocks) . . . $155.00
Set No. 14A (Angle Blocks) . . $450.00
Set No. H. D. 24 . . . $385.00
Set No. H. D. 36 . . . $450.00

Webber Standard Gage Blocks

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Lubrication of Gearing—II

OIL LUBRICATION OF INCLOSED GEAR UNITS

The recommendations which follow cover the lubrication of inclosed gear units of all types within the range of sizes of commercial inclosed gear drives.

Limitations

1. The recommendations which follow are applicable to inclosed gear drives in which the high-speed shaft rotates within a nominal speed range of 600 to 1,800 r.p.m. One exception to this is high-speed gear units which normally operate at speeds higher than 1,800 r.p.m. The recommendations for these are shown in Table II.
2. For spur, helical and herringbone gearing, the recommendations as shown apply only to gears cut after heat-treatment. If they are heat-treated after cutting, the next higher AGMA lubricant number is to be used for a given unit size and ambient temperature.
3. The recommendations as shown for units using straight or spiral bevel gears are for gears heat-treated either before or after cutting.

Lubrication Recommendations

1. Table II shows the grade of oil to use for drives of all types except those employing worm gears, and this latter group is covered by Table III.
2. When operating in the 0 to 40 deg. range of ambient temperature, the lubricant selected must have a pour point below the lowest temperature expected.

Maintenance

1. To obtain long life from a gear unit, it is necessary that the oil be clean and free from sludge at all times. To be assured of this, the oil must be changed at regular intervals.
2. For a new unit the oil should be drained at the end of two weeks operation and the case thoroughly flushed with light flushing oil. For refilling, the original oil can be used if it has been filtered, otherwise new oil must be used. After this, a change of oil every 2,500 hr. of operation or every six months, whichever occurs first, is sufficient for units operating under normal conditions. Where operating conditions are severe, such as a rapid rise and fall in temperature of the gear case with accompanied sweating of the inside walls and resulting formation of sludge, or where operation is in moist or dusty atmospheres or in the presence of chemical fumes, it may be necessary to change the oil at intervals of one to three months.
3. Sludge in gear units may be caused by metallic particles ground off the gears, from dust and dirt and by the presence of moisture or chemical fumes. Therefore, every precaution should be taken to prevent water and foreign particles from entering the gear case.

OIL LUBRICATION OF OPEN GEARS

The recommendations which follow cover the lubrication of open and semi-inclosed gearing of all types.

Limitations

These recommendations are applicable to gears operating at moderate and slow speeds. The maximum permissible speed is that at which the lubricant will adhere to the teeth and will vary with the application and operating conditions.

This part covers oil lubrication of gears as distinguished from grease lubrication. The oil used may, however, contain special additives to increase its adhesiveness.

Methods of Lubrication

Various methods have been devised for the lubrication of open gearing because of the wide range of applications in which they are used. These methods can, however, be grouped in two general classes which are as follows:

(*a*) Slush-Pan Lubrication

This method of lubrication is recommended for high-grade, heavily loaded gears operating at moderate and slow speeds. It involves the use of a slush pan mounted below one of the gear elements in a position such that a number of gear teeth are submerged in oil.

Table IV—Recommended Lubricants for Open Gearing of All Types Except Worm Gears

Method	Ambient Temp., F.		
	0-40 AGMA No.	41-100 AGMA No.	101-150 AGMA No.
Slush Pans	3	5	6
Hot—by brush or paddle	10	10	11
Cold—by brush or paddle	6	8	10
Hand-oiled	4	6	8

Table V—Recommended Lubricants For Open Worm Gears Only

Method	Ambient Temp., F.		
	0-40 AGMA No.	41-100 AGMA No.	101-150 AGMA No.
Cold or hot—by brush or paddle	6	8	

The oil used should be of a tacky nature so that it adheres well to the tooth surfaces. It should be heavy-bodied but not so heavy as to channel in the pan.

(*b*) Hand Lubrication

Hot—by brush or pouring

On applications where a slush pan is impractical, this method of lubrication is recommended for moderate speeds and heavy loads or when gears are operating at elevated temperatures. It consists of heating the lubricant to a temperature such that it flows freely and is then applied to the gears with a brush or by pouring. An extremely adhesive lubricant should be used.

Cold—by brush or pouring

This method of lubrication is recommended only for slowly moving and roughly cut or cast teeth carrying comparatively light loads. It consists of applying the lubricant to the gears with either a brush or paddle. The oil used should be adhesive in nature so it will stay on the teeth.

Hand-Oiled

This type of lubrication is limited to small gears which are used principally for motion transmission where the loads are very light. The oil is applied by merely pouring on the gear teeth.

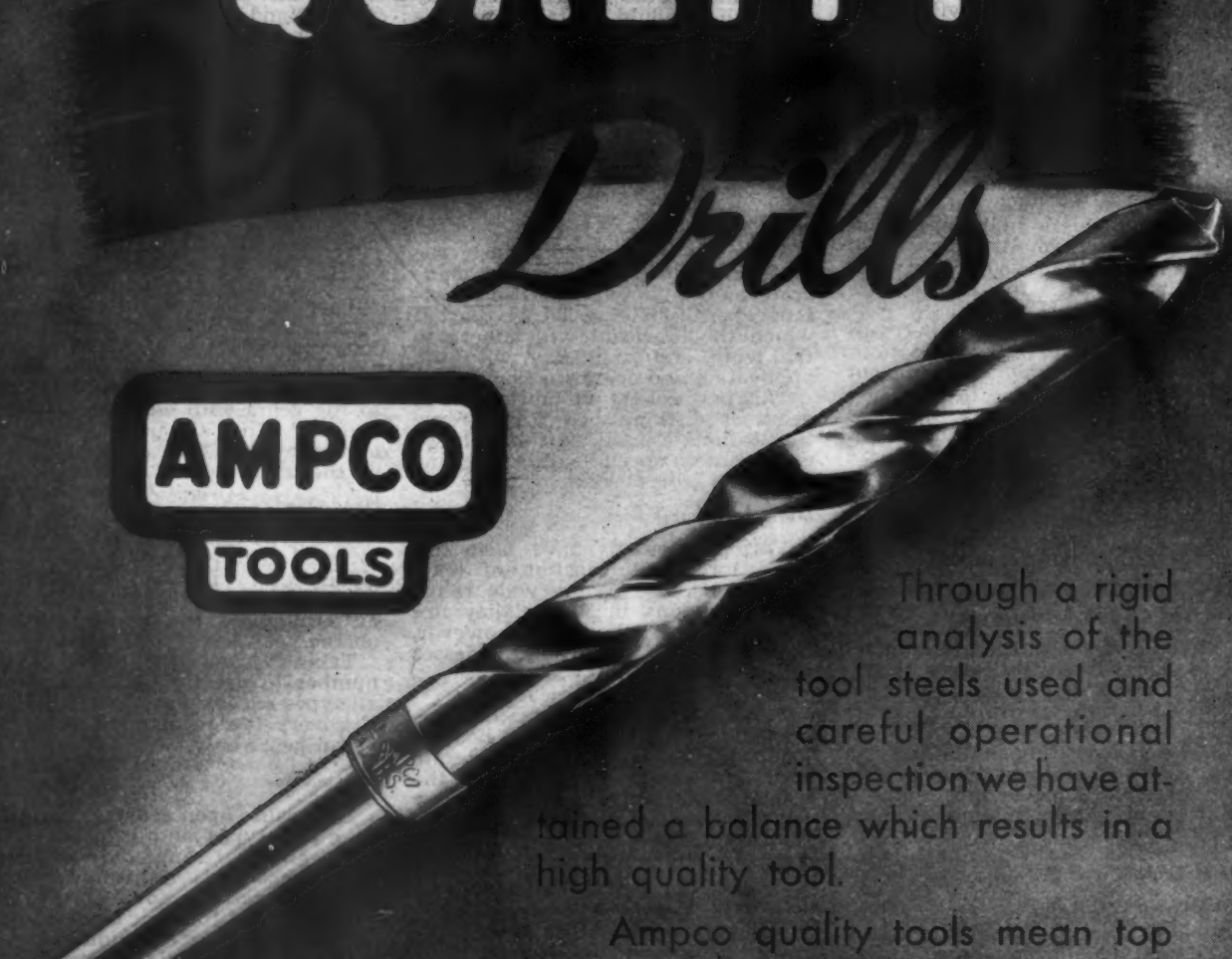
Table IV shows the proper AGMA number to use for open gearing of all types except worm gears. Table V covers the recommendations for worm gears only.

Maintenance

1. Because open gearing comprises so many types and is used under such a wide range of operating conditions, it is difficult to make recommendations applicable to all situations. Often such gears are protected by dust-excluding, sheet-metal housings while others have no covering.
2. For slush-pan lubrication, the oil should be changed once every six months for applications where it is not subject to dust or contamination. Where dust or an excessive amount of moisture is present, the oil should be changed every two to four months.
3. All hand-lubricated gearing depends on the periodic application of oil to the gears to maintain a constant film. The frequency of application depends on speed, load, and operating condition and may vary from one hour where speeds and loads are high to 24 hours for lightly loaded, slow-speed drives.
4. Gears operating in dusty atmospheres should be periodically cleaned with kerosene or other suitable solvent. The dirt and grit adhering to them can seriously damage the tooth surfaces if it continuously passes through the mesh.

QUALITY

Drills



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Gaging Business

Cancellations Start

The cancellation of military machine tool orders has started, and over $20,000,000 in such orders has already been removed from the books of tool builders. This development dove tails with the government's announcement that the "green light" has been given to the automobile industry to enable it to secure the tools it will need for reconversion. This means that the eased pressure for military deliveries will aid the tool industry to provide the machines needed for reconversion.

Tool cancellations were the inevitable aftermath of the placing of millions of dollars in military orders, after the Allied set-back in Belgium, for new facilities to make ammunition, mortars, tanks, and trucks. However, the swiftly drawing close to the European War makes it apparent that some of these facilities would come into production too late.

The first cut was in tools ordered for the medium ammunition and mortar program, after the scheduled new plants were cancelled. This means the wiping out of some $7,500,000 in tool business, and this has come out of the $50,000,000 Pool Order program.

Tanks, Trucks Cut

The second cut is the $15,000,000 or so in tool orders for the heavy tank program. Since the new heavy tank facilities were scheduled to achieve volume production in October of this year, it was apparent that orders for the necessary tools should have been placed by mid-March to permit deliveries early enough to meet schedules for operation of the tank component facilities. Since the orders had not been placed early enough, it is quite likely that the decision to cancel the heavy tank program was made earlier than it was announced.

It is reported that the heavy truck program has been cut, but the extent of this reduction has not been disclosed. However, it would add to cancellations in machine tool orders in the industry's backlog.

Industry Pressure Eased

Since WPB had warned the tool industry late in February that $300,000,000 in new military tool orders would be placed, it appeared then that the industry would be under considerable pressure for some time. The industry's backlog at the end of February was at $303,000,000, while shipments were around $37,000,000 per month. Labor shortages and component bottlenecks had prevented tool builders from lifting shipments closer to incoming orders of around $60,000,000 monthly. Now, the picture is entirely changed. The bulk of the $300,000,000 in new orders that WPB had spoken about will never be placed.

At the end of February, military and rated orders totaled $130,000,000. Despite new critical orders that were probably placed in March, the effect of April's cancellations and essential deliveries in March and April have probably cut this total. Moreover, incoming orders have probably dropped sharply below the recent high level of $60,000,000 monthly.

Reconversion Prospects Better

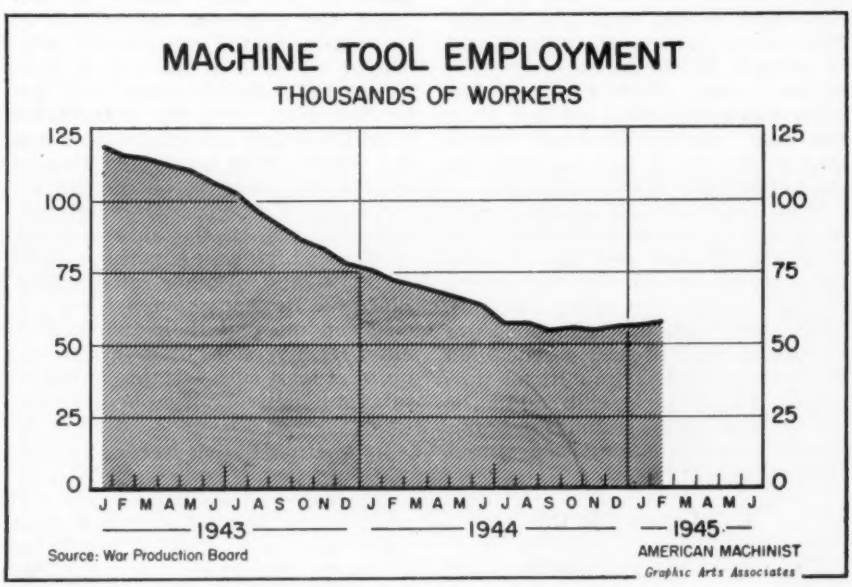
This eased tool situation should enable WPB to keep its promise to the auto industry that it will secure the $40,000,000 in reconversion tools it needs to resume automobile production. However, if the industry is to secure deliveries within five or six months, as required, it will be necessary for it to receive a rating for its orders, and a high one at that. Right now, tool builders have some $80,000,000 in Russian orders on their books, rated AA-1, and this business will get preference over reconversion tools, unless the latter secure a AA-1 rating, also. It is reported that the auto builders have been promised a rating high enough to assure deliveries.

In recent months, some industries which had placed unrated orders for tools required in reconversion, were subsequently able to secure ratings for these tools as a result of stepped up military business in their plants. It is estimated that some $15,000,000 in such unrated orders have been rated. This shift will aid reconversion further.

VE-Day Plans

It is reported that the reductions planned for VE-Day will be largely in aircraft, ammunition, and combat and motor vehicles. Most other programs will be relatively little affected, but it should be noted that some of them, such as shipbuilding, will continue on a declining scale. The 12 percent reduction announced as taking place in the three months following VE-Day will partly represent cancellations and partly reductions already programmed. Some observers believe that VE-Day cuts will be heavier.

The cuts in the aircraft program are expected to be largely in Liberators and Fortresses. B-29s, the jet planes, Navy carrier planes, Army long range fighters, transports, and new type fighters and reconnaissance aircraft will not be affected. Regardless of the large number of planes that the services now have, it is natural for them to desire to replace combat planes with the latest improved types available.



Still Far to Go—Although the February labor force in tool plants at 57,300 workers was an improvement over November's low point of 55,000, it was 20 percent below the February, 1944, total of 72,500 employed. This decline, which includes loss of skilled toolmakers during the past year, accounts for the industry's inability to lift tool shipments

VE-Day Reduction in Munitions Production Set at 12 Percent

WPB's new reconversion plan regarded as conservative. Post-VE-Day developments may permit larger cut-backs. Ability to regain 1939 production levels is doubted

WASHINGTON — General reaction to WPB's new reconversion plans is that they are too conservative, since most observers feel that cut-backs in the munitions programs are likely to be larger than announced after VE-Day. It is reported that uncertainty over how swiftly materials can be converted from the European theatre of operations to the Pacific fronts was a restraining factor in setting immediate VE-Day cuts at such a low level. In any event, the program is regarded as being laden with many qualifications and uncertainties.

Over-all, most observers are relieved by the reopened frank discussion of reconversion planning, which had become taboo after the last German advance. But the bright military picture in Europe in March and April, caused War Mobilization Director Byrnes to prod various war agencies on their reconversion plans, and his mention of the subject in his April 1st report to the President (just before his resignation), opened the way for WPB revelation of its latest plans.

12% VE-Day Reduction

WPB Chairman Krug announced that munitions output would drop 12 percent in the first quarter after VE-Day, another eight percent in the following quarter, and 15 percent more in the next six months. This meant an over-all reduction of 35 percent in munitions production within a year after VE-Day. But what was not pointed out was what the cuts represented, and where they might lie, as well as what the cut percentages were based on.

It is reported that Krug's statement was based upon June 30, 1945 as being VE-Day, and the percentage cuts are in relation to average second quarter monthly output. More than that, the reductions are said to include presently scheduled declines in various munitions programs. For example, shipbuilding is on a downtrend, cotton duck has passed its peak, ammunition output is receding, and so on.

1939 Levels Far Off

The second major question about WPB's reconversion plans was over the statement that a year after VE-Day the "over-all rate of civilian production might reach 1939 levels." This statement has been previously made and often challenged on the grounds that the occupation of certain plants, facilities, and skilled manpower on continuing war programs, and the material requirements for those programs, would disrupt and curb the extent of civilian production that might appear possible via statistical analysis, upon which WPB's statement was based. Thus, critics feel that somewhat fewer durable goods such as automobiles, refrigerators, etc., could be made than in 1939.

WPB's reconversion plan will attempt to: (1) distribute cut-backs equitably so as to make the general war production load fair; (2) help reconverting industries to secure tools and other needed equipment; (3) suspend or ease most restrictions and limitations on material and equipment deliveries and production; (4) substitute a simple priority system for CMP; (5) retain controls over items in tight supply, such as tin, rubber, textiles, and lumber.

Polk Awarded Gold Medal By Army Ordnance Association

DAYTON—Louis Polk, president, Sheffield Corp., has been awarded the Gold Medal of the Army Ordnance Association for outstanding service. Mr. Polk has aided the development of measuring instruments and gaging system standardization with Ordnance.

Auto Industry Promised $40,000,000 In Reconversion Tools When Needed

WASHINGTON—It is reported that the auto industry has been given assurances by the War Production Board that it will receive the machine tools it needs for reconversion within five or six months. It is said that the industry will secure favorable priorities right after VE-Day, thus permitting the scheduling and delivery of these tools as needed.

The industry needs $40,000,000 in machine tools, and about $10,000,000 more in accessories and cutting tools. Such orders are now on the books of the tool builders as unrated, and represent almost half of the total unrated business of $83,000,000 on hand at the end of February, 1945. Before these tools can be delivered, both the $130,000,000 in military and essential orders and the $90,027,000 in high-rated Russian orders will have to be cleared off the industry's books. Only alternative would be if the auto industry receives a high rating, perhaps equal to the highest in other rated orders. Since the Russians have a AA-1 priority on most of their tool orders, auto reconversion tools would require at least such a rating to secure favorable delivery treatment.

High Rating Needed

The way matters stood at the end of February, the industry had about eight months in unfilled orders on its books. Since then, some $25,000,000 or so in orders have been cancelled, and new military orders have dropped sharply. But since essential orders for replacement tools by plants in war production will continue to be placed in coming months, it is obvious that a high rating for reconversion tools will be necessary to assure their delivery. It is reported that Russian orders would otherwise block auto tool production in at least nine plants.

If the auto industry receives these tools as needed, it will still face obstacles to prompt reconversion: (1) possible difficulty over OPA price rulings, wages, and operating costs; and (2) war orders will straddle the industry's plants, necessitating emergency arrangements and readjustments to permit partial reconversion to war production. It is pointed out that some auto plants are almost fully engaged in making B-29 parts and engines, and there is little prospect of any cut in the B-29 program. The plants producing jet-propulsion planes and engines, and Navy rockets, also face the prospect of no cuts after VE-Day.

Draft Also Handicap

The draft has been a further handicap, since persons assigned to reconversion planning are subject to immediate draft, and some such personnel has already been lost. Most serious of all, is the indication that the CIO auto workers will probably withdraw their no-strike pledge after VE-Day. In view of the recurrent labor disturbances that have hit the auto industry during the past few war years, some observers fear that this situation may grow worse after VE-Day. The attempt to unionize foremen will not help matters.

In any event, experienced observers feel confident that there will be no passenger cars on the market before March, 1946.

Detroit Letter

Planning for VE-Day

The shoe is now on the other foot. Where last October the automotive industry was prodding the War Production Board to get into position for the end of the war, it is the WPB which seems to be doing all the prodding and planning now.

The industry came in for some heavy criticism on the last occasion when it attempted to make Washington conscious that jobs for thousands, perhaps millions, depended on pre-planning. It was hinted that it was going back to a "business as usual" attitude, instead of finishing off the war.

Nelson Making Progress

Now all is changed. J. A. Krug, head of WPB, has been in the automotive capital, conferring, comparing notes, blueprinting the post V-E period. He left behind him his most trusted and energetic assistant, Henry P. Nelson, as co-ordinator to go deeper into individual problems and seek solutions for them.

Nelson has been doing a most thorough job. A youngish former executive of International Harvester, he is primarily a production man. And a production man is something near and dear to the hearts of the industry executives. They feel only a production man can understand their individual problems and Nelson hasn't disappointed them.

Industry-WPB Meeting

Krug's visit to Detroit was an unexpected one. It was originally set as a very hush-hush flying visit in which he would dart into town, size up the situation and dart back to his post in Washington.

But someone spilled the beans. Then the wraps were taken off. He bundled 15 of his most trusted aides, including H. G. Batcheller, John Chaffee and Nelson into two planes and swooped in on the auto industry.

The august board of the Automotive Council for War Production, in session that day, extended its meeting so that Krug and his staff could sit around the table and exchange information. It included not only car builders but truck manufacturers, parts men and the services.

Both sides came away with a hearty respect for each other. Krug said it was the "best meeting I have ever attended with a large industry." The Council board voted him an energetic and resourceful young man who had some ideas and could be trusted to carry them out.

Coordination Required

But as far as clarifying the situation on when and how the industry would reconvert, it accomplished little. General principles and problems were bared. But so competitive is the industry, that Krug saw that each company would have to be accorded individual treatment. So he announced Nelson as co-ordinator of his post V-E program and left him to pay calls on the various companies.

This Nelson has done and has carried his findings to his boss. What happens from now on is to be based on this and Krug's 12-point program announced recently on relaxation of controls over plants, materials and machines.

Tool Prospects Bright

The industry still insists that the nub of the reconversion task, the obtaining of at least 5,000 key tools, is closer to realization. Both Krug and Nelson are aware of this and John Chaffee, head of the WPB tools division, is sympathetic. Unofficial sources say that something has been worked out on this that will render "substantial aid" in obtaining the long-term tools, those which require the greatest lead time. "It will not be entirely satisfactory to the industry but it will go a long ways toward helping out," said the source.

Krug announced that high-priority military orders, not needed immediately, may be shunted aside for a month or so to get some of the key tools into production.

Besides tooling, the industry is concerned with quick clearance of plants and reconstruction of the factories. It wants pre-determination agreements reinstated. They have been discontinued after an encouraging start.

No Even Start

One thing was made clear during Krug's visit here. While the industry has held steadfastly to the position that it wants an even start for all companies, it does not contend that each should wait until all are in a position to go ahead with car production.

"What we want is a policy that will apply to all equally," said George Romney, head of the Automotive Council. "We don't expect that each company will have to wait for the rest to get clear. But with a clean-cut policy applicable to all, each can work out his destiny."

Each company has some problems which are peculiarly its own. In General Motors, it is body production, according to C. E. Wilson, president. To overcome this handicap, Wilson stated that the divisions would probably limit their models. Each division would get enough materials to start off one model.

Textiles Limiting Factor

Observers believe the big factor that will limit production of cars is the tightness of textiles. While there are other shortages, the lack of textiles will be a deterring factor.

Cottons are expected to be in tighter supply when the European war is over than now. And when you consider how much cotton and other textiles go into an automobile, it is readily seen how much of a handicap this may become.

Mass Production of Rocket Fins—Assembly line methods, shown here, at the Pontiac Plant of the Fisher Body Division of General Motors, enabled the company to make its first shipment of fighter plane rocket fins in less than a month after receiving orders. The fins move between the arc welding booths on the right and the resistance welders on the left in troughs

Cuts in U. S. Munitions Orders Aid Canada Toward Reconversion

MONTREAL—In line with reductions in the United States of the ammunition programs increased last December, Canadian plants have received sizable cancellations of small arms ammunition orders which had been placed here by the United States. Since further cancellations of various types are expected, it is too early yet to ascertain what the over-all cut-backs will be. However, it is likely that this will be followed by reductions in United States requirements for Canadian copper and brass.

Since many areas continue to be short of labor, the reductions in these munition orders should not disrupt Canadian employment to any great extent. Observers predict that all available manpower will be required until Japan is beaten, with the slack then being taken up by the enormous pent-up demand for civilian goods.

Reconversion plans have been drawn up by many Canadian companies now making munitions, and if there is a slump at all it will be temporary and contingent upon the switchover of plants and machines, according to present indications. Canadian shipyards which have already turned out more than a thousand war vessels of all types are already getting into stride for postwar construction.

Ships are being built in Montreal for Brazil, and at points across the Dominion, as well as in Montreal, 35 steamers will be started in May for China. Meanwhile, the Dominion's shipyards are engaged in building landing craft and other vessels for Allied use in the Pacific.

Postwar Price Prospects

Pressure on prices may be even greater after this war than after 1918, was the warning of Donald Gordon, Canadian Wartime Prices Board chairman in his annual report. He predicted that the end of the war will bring new problems in preventing inflation as well as shortages of some supplies.

"The Board's objective is to remove price control at the earliest feasible moment consistent with preventing a war-generated inflation," Mr. Gordon said.

GLEASON WORKS CELEBRATES 80TH ANNIVERSARY

ROCHESTER — The Gleason Works celebrated its 80th Anniversary on April 7th, by holding open house at its plant for some 7,000 visitors, and arranging a special luncheon attended by Army and Navy officials, leading machine tool builders. E. Blakeney Gleason, vice-president, treasurer, and general manager presided at the luncheon ceremonies.

Tell Berna, general manager, National Machine Tool Builders Association, in a speech before 400 luncheon guests, pointed out that machine tool builders' prospects after the war will be excellent, because the builders are never satisfied and are continually improving their products, thus increasing production and improving standards of living. He said that the postwar standard of living would be improved if old machine tools were scrapped and replaced by surplus tools built during the war.

GENERAL MOTORS' MUNITIONS SHIPMENTS NEAR $10 BILLIONS

DETROIT—With its 1944 deliveries of war products coming to $3,843,892,000, General Motors had shipped almost $10,000,000,000 in munitions, since the beginning of the defense program. As a result of the company's policy of reducing prices on war materials, its 1944 munitions dollar volume only increased three percent even though the physical volume rose 15 percent. The company's 1944 net income of $170,995,865 represented 3.7 percent of total net sales of $4,262,249,472, and compared with net earnings of $149,780,088 in 1943, which was a 3.3 percent return on total net sales. Earnings compared with U. S. and foreign income and excess profits taxes of $264,413,156 for 1944. The company's postwar program is expected to cost $500,000,000.

Munitions Development

In its Annual Report, the company commented on the successful cooperation of military authorities with industry technicians in improving existing weapons and developing new ones, but it warns that "if we are to win the peace, we must continue equally close liaison."

Foremen's Union Opposed By Auto Industry; CIO-AFL-Chamber Pact Hit

DETROIT—A major revision in industry's supervisory set-up is threatened by the National Labor Relations Board's recognition of the new foremen's union. Led by General Motors, those firms not yet affected by the status given the Foremen's Association of America are girding for a fight within the framework of the Wagner Act.

C. E. Wilson is an outspoken foe of unionization of foremen. He has sent out letters to his 25,000 "management employees" putting himself and the corporation on record clearly and unmistakably. He stated bluntly: "General Motors opposes the unionization of foremen. If our foremen unionize, we will have to change our whole supervisory set-up. We would have to set up a new strata of supervisors."

Foremen Union Evils

Wilson saw the results of unionization of foremen as increasing costs by inserting a new segment of workers, inefficiencies, increased production costs, and higher living costs. He expressed the hope that his foremen would not seek bargaining rights. "But if they do," he added, "we will have to take management functions away from foremen."

So far, Packard is the only auto plant affected by the reversal of the NLRB position on foremen. George T. Christopher, Packard president, has indicated he will not try to stop a vote on this by his foremen, but if they approve the FAA, he will not give up the fight.

Labor-Chamber Pact Hit

Meanwhile, the Johnston-Murray-Green "Magna Charta for Labor," which came out of Washington recently, promises to be another "Versailles Treaty." It promises to bring a bigger labor war than ever.

B. E. Hutchinson of Chrysler has sounded the rallying cry against acceptance without clarification. Even before he told a Washington press conference what he felt about it, Harvey Campbell, secretary, Detroit Board of Commerce, has denounced it in no uncertain terms. He found three things wrong: (1) The code in its present form does not seem to put enough emphasis upon the importance of production, the necessity for work; (2) Possible misinterpretation that industry agrees to freezing present statutory laws applying to labor; (3) Insufficient recognition of the general public interest, and possible misconstruction as labor-industry agreement to promote their own interests.

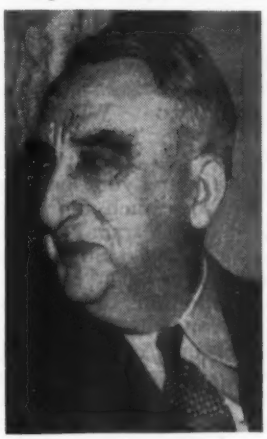
Washington Bulletin

Roosevelt's Policies

The shock and grief of the President's sudden death was immediately followed by considerable speculation here over its effect upon various programs and policies the late Mr. Roosevelt had personally sponsored and supported. There will be no misgivings about the continued favorable course of the war, and continuation of planned steps for international collaboration to prevent future wars. But serious questions arose over the future course of the administration's pro-labor policy, over the continued hit-and-miss cooperation of the Southern Democrats with the Liberal Democrats, over the new President's ability to maintain harmony in the ranks of labor, and to hold together the conglomerate forces previously gathered behind Roosevelt.

Predictions were made of many changes that would probably develop in various appointive posts. Speculation on the jobs of Secretary of Labor Perkins and Secretary of the Interior Ickes was natural, as it has been many times in the past. Over-all, opinion leaned to the probability that the new President's strength might very well lie in increasing the support of the conservative groups, which backed Roosevelt sometimes, unwillingly, by a mild retreat from some of Roosevelt's more liberal policies.

New OWMR Director



Fred M. Vinson

Mr. Vinson has been a busy appointee. Former Director of Economic Stabilization, then Federal Loan Administrator, he now becomes Director of War Mobilization and Reconversion

British Tool Deal

There is some feeling that considerable misunderstanding has prevailed regarding the recent sale of 58,000 American machine tools to the British for $166,000,000. Unfortunately, the complete facts were not disclosed at the time the transaction was announced. Upon further investigation, the deal appears to have been a very favorable one for the United States.

Inquiry discloses that almost half of the tools involved were special munitions-type machines, which will have virtually little postwar use. It is reported that the British plan to set most of them aside in a military reserve, after their need for war work has ended.

The second interesting revelation is that some of these tools, now owned by the British, are still being shipped back here for use under reverse lend-lease by American plants producing munitions. Thus far, $41,500,000 in such tools has been returned to the United States since the transaction, or lost in transit due to enemy action. Moreover, the bulk of the tools remaining in England will be kept on war work until after the fall of Germany, and half of them will be needed for munitions production until the end of the Japanese War.

It is also significant to note that 32,000 of these tools were shipped to England from March 11, 1941 through the end of 1942, 20,000 were delivered during 1943, and 6,000 in 1944. In other words, most of the tools were over three years old, and under the Clayton formula for domestic surplus government tools would have been salable at about half of their original cost.

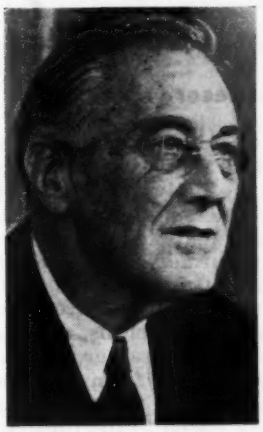
Foreign Trade Prospects

Some experts in foreign affairs have expressed amusement in the Administration's expressed objective of putting international trade on a free basis. This objective has been publicly declared to favor the elimination of tariffs, cartels and monopolies, Empire preferences, special subsidies, and other private and governmental devices. But foreign experts inquire how this nation can favor free international trade, when it strongly exercises many controls and restriction on its own industry. It is true that many of them have arisen out of war emergencies, but some of them have been considered as possible permanent controls.

Foreign experts further feel that our free trade policy will be a failure unless the United States overhauls its domestic farm policies, ends its subsidies to cotton and wheat in the world market, stops limiting imports of cane sugar to protect domestic beet sugar interests, and places similar curbs against meat imports. Since the Farm Block is so strongly organized, it is felt that the government will be unable to push its international trade policies, unless it makes compromises with the farm group.

These conflicting policies point to probable compromises in the basic objective of free international trade. The major compromise will probably be that international trade will not be entirely free, but will be managed by individual governments through multi-lateral deals.

Death Grieves Nation



Franklin D. Roosevelt

The death of President Roosevelt on April 12, 1945, came just when Allied Armies were closing in on our enemies. The former Vice-President Harry S. Truman has assumed the presidency to carry on the huge task

Patent Office Worries

It is not well known, but the Patent Office comes under the jurisdiction of the Department of Commerce. In recent years, the administration has been taking subtle steps aimed at throwing open patents, and removing the protection that patents have heretofore offered to inventors and to industry. This policy has resulted in a declining number of new patents being taken out in recent years.

With Wallace in charge of the Department of Commerce, there are reports that this anti-patent trend will continue. It is said that the present head of the Patent Office may be removed and someone more amenable to Wallace's philosophies may be appointed.

Spotting the Air News

March Record Poor

The aircraft production gain of 12 percent in March was a mirage. Actually, the daily rate of 261 planes per day in March was slightly less than the daily rate in February. WPB Chairman A. J. Krug explained that many of the 7053 units delivered in March were holdovers from previous months, some awaiting better test weather, some awaiting components from sub-contractors. Of course the fewer days in February added to the illusion. February output was 6286.

Improving Jet Power

Two of the hardest problems along the way to improvement of jet power are reduction of fuel consumption, and raising the heat endurance of metals used in the rotors. The answer to the fuel question is improved fuel, and of course several of the oil company laboratories are working on that one. Jet power started out using fuels made for other purposes. When they get their own special fuel, they may be able to match the mileage range of conventional engines before this war ends. Army says that Lockheed's Shooting Star jet fighter already meets the usual fighter range requirement. A jet engine does exactly the same thing that a reciprocating engine and propeller does: it blows a blast of air, creating thrust in the opposite direction. Somehow, the engineers intend to make it do the job on the same amount of fuel, or less.

Metallurgists are hard at work on the second big problem: increasing the ability of metals to withstand the high heat and high speed of the turbine-rotors. Near perfection of aircraft engine superchargers, which are similar in many ways, gives the engineers a head start.

Huge Plane Surplus

Two-thirds of all surplus property now available for sale is airplanes. After the war, airplanes will be the biggest item on a $40,000,000,000 shelf of war goods for sale. A tremendous amount of the airplane metal will be overseas. Opinion whether to return this metal to the United States is already divided. Some one has suggested it should not be left abroad as the raw material of another war—perhaps against us. Authorities many times stated, during the materials shortage phase of this war, that most basic metals sources, here and abroad, had been seriously depleted. It seems strange to some observers that there is not an urgent demand to save the mountains of steel, aluminum, copper and lead now in the form of ships, tanks, vehicles, guns and airplanes. Even if it costs more than the market price of scrap.

Four Fighter Types—Four of the Army Air Forces fighter planes in flight make startling contrasts: from top to bottom (a) the new all-wood XP-77, one of the smallest fighter planes of the war; (b) the P-39 Airacobra, the first cannon-carrying fighter still in combat but out of production; (c) the P-63 Kingcobra, the faster and higher flying successor to the Airacobra; and (d) the P-59 Airacomet, the first American jet-propelled plane. All these planes are products of Bell Aircraft Corp.

WPB's Aircraft Division

Now, for the first time, the aircraft industry has its own claimant agency, in the newly re-organized Aircraft Division of the War Production Board. The Office of Defense Transportation was claimant for *all* transportation. In the Division are industry committees for air transport, and for aircraft manufacturing. The Division is now treating the civilian need for airplanes (scheduled and non-scheduled) as a war need, and not as a need to be met if there is something left over. Chances are that the airlines will get some new airplanes this summer or fall, also any companies and individuals who can show the essentiality of their need. WPB called for requests once before, and the whole idea was dropped when the enemy bulged into Belgium.

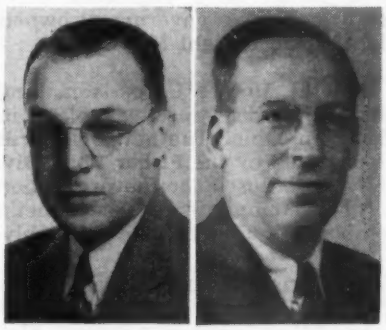
Japs Face Air Armadas

One of the great dramas of history will be the movement of Allied air, sea and land power from Europe to killing positions around Japan. It is surprising that so little has been said and written about the vast war migration to come. General H. H. Arnold, chief of the Air Forces, said in Washington the other day that every airplane in Europe that is useable against Japan will be taken around. When you add up the air power that can be put up against the Japs in any given day by this Autumn, you feel that the result will be much more decisive than it was in Germany. There will be near 1000 Superfortresses, around 7000 or 8000 of the RAF-AAF combinations that have been hitting Europe, plus 2000 and 3000 or more of the American and British Naval air arms—a total of ten to fifteen thousand airplanes attacking the Nip mainlands, which are just over half the area of Germany proper. Both Army and Navy have indicated that production of types of airplanes needed in the Pacific must go on. But it is a safe bet that, as soon as the Allies see the Japs falter, there will be extensive stop orders. PS: Some lunchtable experts incline to add the Russian air forces to those above summarized.

Names in the News

NEWLY ELECTED OFFICERS OF A. S. T. E.

DETROIT—The Thirteenth Annual Meeting of the American Society of Tool Engineers held here late in March was attended by 34 persons, due to wartime conditions, largely comprising members of the Board of Directors and National Committee Chairmen. This small attendance learned that membership had grown to a record of 17,918.



C. V. Briner A. M. Sargent

Newly elected officers for the succeeding year included: President, C. V. Briner, manager, Gage & Tool Division, Pipe Machinery Co., Cleveland, Ohio; First Vice President, A. M. Sargent, president, Pioneer Engineering & Mfg. Co.; Second Vice President, W. B. Pierce, vice president, research and development, Flannery Bolt Co.;

W. B. Pierce T. P. Orchard

Third Vice President, Thomas P. Orchard, general manager, American Tool Engineering Co.; Secretary, A. M. Schmit, general manager, A. M. Schmit Co.; Treasurer, W. J. Frederick, president, Frederick Steel Co.; and Assistant Secretary, W. A. Dawson, chief master mechanic, The deHavilland Aircraft of Can., Ltd., Toronto, Ontario, Can.

The 1946 Annual Meeting of the Society will be held in Houston, Texas, but arrangements for it, and for the meeting scheduled for Pittsburgh on October 15, 1945, will depend upon war restrictions.

D. F. Robinson

Ellis L. Spray

David F. Robinson has become associated with Harrington-Wilson-Brown Co., New York, N. Y., as a limited partner in the sales engineering division. Mr. Robinson, a lieutenant commander recently placed on inactive duty by the Navy, was with Williams Sellers & Co., Philadelphia, Pa., for 13 years.

Ellis L. Spray, vice president and general manager of the Westinghouse Electric Elevator Co., Pittsburgh, Pa., to be dissolved, has been elected vice president of the Westinghouse Electric and Manufacturing Co. in charge of elevator and air conditioning activities of the company at Jersey City, N. J.

Henry P. Nelson has been appointed coordinator of reconversion for the automobile industry. Mr. Nelson, a former executive of the International Harvester Co., has been associated with W.P.B. and its predecessor, the Office of Production Management, since October 1941.

H. A. Toulmin, Jr. has been elected chairman of the board and president of the Hydraulic Press Manufacturing Co., St. Louis, Mo. **Howard F. MacMillin,** former president, has been elected president of the H-P-M Development Corp., research subsidiary of the company.

Ralph H. Maxson has been elected president and **Henry Yoerg,** vice-president, of the St. Paul Foundry & Manufacturing Co., St. Paul, Minn.

Hendry L. Bart, managing editor of a number of aeronautical and technical magazines, has joined the staff of the American Standards Association, New York, N. Y., as director of public relations.

G. H. Brodie, manager of Packard Motor Car Company's marine engine division, has been appointed assistant to the president in charge of special design products.

Dr. Zay Jeffries, vice president of the General Electric Co., Pittsfield, Mass., has been selected as winner of the Clamer Medal of the Franklin Institute. The medal, awarded at least once in every five years, will be given this year to Dr. Jeffries "for his meritorious contributions to the science of metals, which he has placed on a new and more intelligible basis.

Frederick G. Schranz, vice president of Baldwin Southwark Div., The Baldwin Locomotive Works, Philadelphia, Pa., since 1941, resigned as an officer of the company, effective April 30. Mr. Schranz, associated with the division and its predecessor, the Southwark Foundry and Machine Co., since 1915, will continue to act in a consulting capacity for Baldwin Southwark.

W. S. James

L. J. Purdy

William S. James has been named director of automotive research for the Ford Motor Co., Dearborn, Mich. Mr. James, president of the Society of Automotive Engineers in 1944, has been chief engineer of the Studebaker Corp., since 1936.

L. J. Purdy has been elected a director and vice president in charge of trucks of the Dodge Brothers Corp., division of Chrysler Corp. Mr. Purdy has been associated with several automobile firms and has been with Chrysler for the past 14 years.

H. B. Heppenstall, Jr., formerly vice president in charge of sales of the Heppenstall Co., has been elected vice president of the H. K. Porter Co., Inc., Pittsburgh, Pa.

Robert G. Allen has been appointed general manager of Baldwin Southwark Div., The Baldwin Locomotive Works, Philadelphia, Pa.

Keen Johnson, former Governor of Kentucky and assistant to the president of Reynolds Metal Co., has been named vice president of the company.

D. Roy Shoults, formerly engineer of the General Electric Company's Aviation Div. engaged in the development of jet propulsion engines, has joined the Bell Aircraft Corp. as vice president in charge of sales. Active in the field of new product development and application during his 20 years with General Electric, Mr. Shoults will coordinate the sales activities of all three Bell divisions in military, industrial, commercial and civilian fields.

Clare L. Barnes, founder and for many years president of the Houdaille-Hershey Corp., has been elected chairman of the board of directors of Bendix Helicopter, Inc., to fill the vacancy created by the recent death of **Vincent Bendix.**

A. H. Keetch has been made head of the newly-organized sales-service department of The Warner & Swasey Co., Cleveland, Ohio, after a two-years leave of absence during which he served as Chief of Priorities and Distribution Branch, Tools Division, War Production Board, Washington, D. C.

Vincent G. Dodds has been appointed president of the Machinists Tool & Supply Co., Los Angeles, Calif., and **J. Don Reep,** vice president. Mr. Dodds has been with the Aluminum Co. of America for 24 years and since 1940 has been assistant district sales manager for the southwest. Mr. Reep was for 16 years with the National Twist Drill & Tool Co., Detroit, Mich., in charge of their cutting tool service and sales in the states of Pennsylvania and New York.

L. Earle Welch, of the Bakelite Corp., has been elected vice president of the Industrial Hard Chromium Corp., Newark, N. J.

C. M. Bovard has been promoted from chief draftsman to design engineer of The Cooper-Bessemer Corp., Mt. Vernon, Ohio, while **Ralph H. Schlosser** has been appointed to succeed Mr. Bovard as chief draftsman.

OBITUARIES

Amedee H. Smith, 76, pioneer west coast industrialist, died March 25 in Portland, Ore. At the time of his death, Mr. Smith was chairman of the board of directors of the Hyster Co. and president of the Williamette Iron & Steel Co.

Walter B. Smith, 66, chairman of the board of directors of Illinois Tool Works, Chicago and Elgin, Ill., died

Walter B. Smith

Amedee H. Smith

suddenly April 2 at his office. Mr. Smith had been a director of the firm since its inception in 1915 and active in the management of Illinois Tool's affiliated companies—Shakeproof, Inc. and Canada Illinois Tools, Ltd., of Toronto, Canada.

Herbert W. Forster, 47, advertising manager of Western Electric Co. died suddenly March 30 following an acute heart attack.

Alfred V. deForest, 55, founder and president of the Magnaflux Corp., died April 5. Prof. deForest, a member of the Department of Mechanical Engineering at the Massachussets Institute of Technology at the time of his death, was best known for his development of the Magnaflux test, a magnetic method of discovering defects in metals.

William R. Stuebing, 61, president of the Stuebing Automatic Machine Co., Cincinnati, Ohio, passed away April 5. He had been active in the development of industrial truck transportation.

Charles E. Sweet, president and founder of the Superior Machine & Engineering Co., passed away March 11.

George H. Wright, 62, died March 26. Mr. Wright was among the first to produce stainless steel and was a contributor to many improvements in metal since he began working in 1902 at the works laboratory of General Electric Co., Schenectady, N. Y.

BUSINESS ITEMS

Westinghouse Electric and Manufacturing Co. has formed an **Aviation Gas Turbine Div.** for the manufacture of military, and later, commercial gas turbine aircraft engines based on the jet engine. Manager of the new division, which will have its headquarters at the Westinghouse South Philadelphia works, is **George H. Woodward,** formerly manager of the New Products Div. at East Pittsburgh, Pa.

Harron, Rickard & McCone Co. of southern Calif. has purchased the entire property and buildings of its predecessor, **Harron, Rickard & McCone Co.,** at 3850 Santa Fe Ave., Los Angeles, Calif. The new company will continue to serve as sales representatives for a large group of well-known machine tool builders.

Murchey Machine & Tool Co., Detroit, Mich., have expanded their operations into a government owned plant at 19660 Eight Mile Rd.

General Motors Corp. is making plans to build a postwar plant in Hamilton, Ohio. The new plant will be operated by the **Fisher Body Div.** and will be used for the production of body stampings and sheet metal components used in body assembly.

The Briggs Clarifier Co., Washington, D. C., has appointed **Mack Sales,** 425 E. Platt St., Tampa, Fla., as their distributor for Florida.

Geroter May Corp., Logansport, Ind., has appointed **Compressed Air Products,** Newark, N. J., as exclusive sales representative of Geroter air and hydraulic devices for New Jersey and greater New York.

C. Allen Fulmer Co., 1220 First National Bank Bldg., Cincinnati, Ohio, has purchased the **Production Honing Machine Div., Automotive Maintenance Machinery Co.,** No. Chicago, Ill. The Fulmer company has taken over only the manufacture and sale of the large hydraulic Production Honing machines, but does not effect any of the other AMMCO products.

The **St. Paul Engineering & Manufacturing Co.,** St. Paul, Minn., has changed its name to the **St. Paul Foundry & Manufacturing Co.**

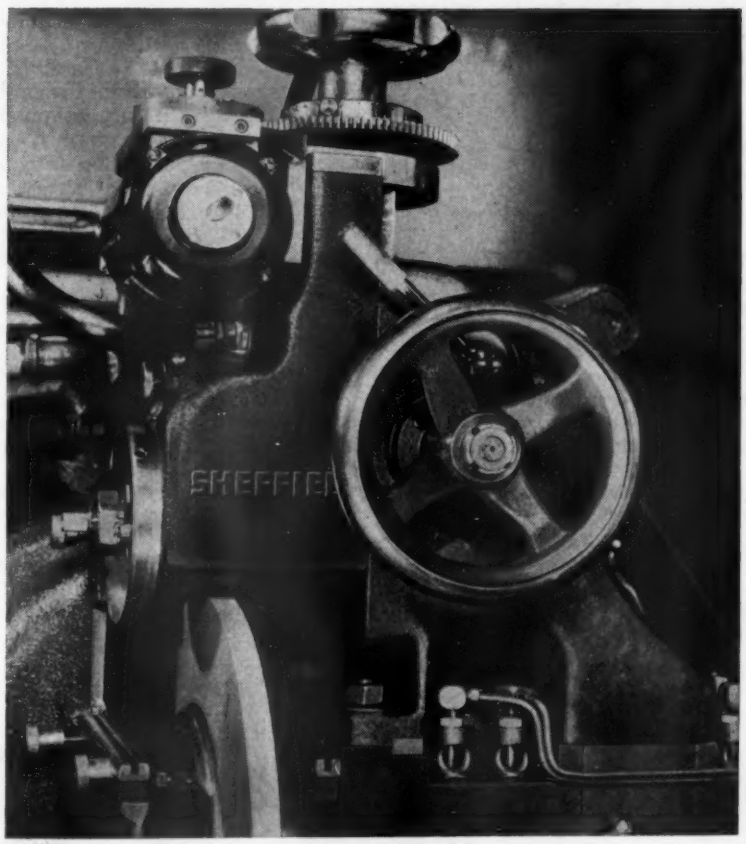
Lempco Products, Inc., Bedford, Ohio, has been allocated a fund of $2,200,000 by the **United States Defense Plant Corp.** for building and equipping a manufacturing plant and a forge plant in Byesville, Ohio.

The Ohio Crankshaft Co., Cleveland, Ohio, has appointed **Perry Machinery Co.,** Dallas, Texas, as a special distributor of TOCCO process induction heat treatment equipment in the southern area.

Frank J. Kenney, 815 James St., Syracuse 3, N. Y., has been appointed distributor for the **Phillips Manufacturing Co.** and the **Phillips Chemical Co.,** Chicago, Ill., for that area of New York State from Rochester east, excluding the New York City area and including Vermont.

Shop Equipment News

Powered Crush Dresser Improves Crush-Formed Wheel Grinders



Sheffield crush dresser

An electrically powered crush dressing device for forming the wheel on the precision thread and form grinders made by The Sheffield Corporation, Dayton 1, Ohio, has been perfected by that company. It is available in two styles, either of which can be applied to new Sheffield machines or to those now in use.

With Model A, the operator presses a button after the crusher roll has been manually lowered into contact with the grinding wheel which is made to revolve at grinding speed. The coolant flow is directed over the crusher roll at the same time it is power fed into the wheel, at a constant rate, until the feed indicator dial on the crushing device shows that the desired depth of dressing has been reached. The operator who has watched the operation releases pressure on the push-button, thus stopping the wheel, crusher infeed and flow of coolant. He then lifts the crusher out of wheel engagement and the grinding of the work continues.

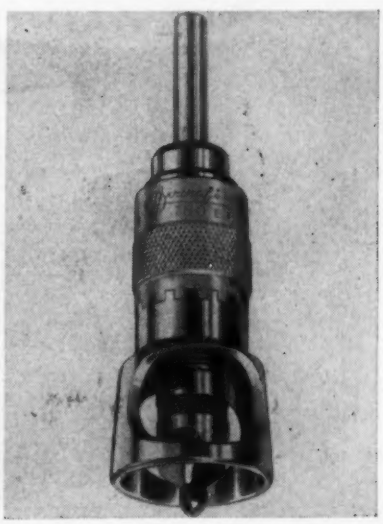
Model B is semi-automatic and is distinguished from Model A in that the feed dial indicator is present for a desired depth of automatic in-feed of the crusher roll. After removal of the wheel guard and lowering of the crusher roll in contact with the wheel, the closing of an electric switch starts the cycle of coolant flow, crushing wheel speed, and feed of the crusher into the wheel. The automatic cycle continues until the desired depth of in-feed is reached, at which point the coolant, in-feed of crusher, and rotation of grinding wheel are automatically stopped. The operator then manually returns the crusher roll to upper position and continues with grinding of the work.

These power crushing devices have advantages over manual crushing, including reduction of dressing time by 50 percent and increased life of crusher roll due to the uniformity of crushing and smoothness of in-feed. More parts are obtained per dressing because the wheel is always formed under identical conditions of in-feed and pressure.

Model B has an additional advantage of keeping the amount of stock removed from the wheel to a minimum, since the human element is entirely removed from the actual wheel dressing operation so that both wheel life and crusher life are held to a maximum.

Bell Skirt Stop Countersink Has Micrometer Adjustment

A micro-set stop countersink with a large bell skirt is manufactured by Aircraft Tools, 750 E. Gage Avenue, Los Angeles 1, Calif. The bell skirt gives added base support for better tool alignment and greater chip clearance. This model has a positive micrometer adjustment. It is compact and light weight, and is pre-



Aircraft tools stop countersink

cision-made from high speed tool steel. The shaft runs in an Oilite radial bearing with a ball bearing thrust. Concentricity of shaft, pilot and cutter limits is held to close tolerances. The cutters are accurately ground for correct cutting angles. Polished flutes help to discharge chips at high speeds, and give chatterless performance. A spring retracts the drive shaft for cutter protection.

The countersink takes cutters up to ⅝ in. dia.

General-Purpose Welding Electrode Has Low Spatter

A shielded arc electrode for general-purpose welding of mild steel is produced by The Lincoln Electric Company, Cleveland, Ohio. The electrode, designated as Fleetweld 47, offers such advantages as extremely low spatter loss, easy slag removal (most welds are practically self-cleaning), excellent restriking characteristics, and other improved features.

Fleetweld 47 conforms to American Welding Society electrode specifications Class E-6012 and E-6013 and can be used with either alternating or direct current. It is especially suited for making high-speed horizontal or flat fillet welds over 4-in. long in which the coating can be dragged on both plates. It has also been used extensively for both vertical and overhead fillets, especially where large single pass fillets are desired. Complete penetration of ¼-in. plate can be obtained by welding one pass from each side.

The electrode is available in the following sizes: 5/32 × 14 in.; 3/16 × 14 in.; ¼ × 18 in. and 5/16 × 18 in. The electrodes are packed in 50 lb. containers and are available from stock.

Indexing Work Carrier Mounts on Induction Heater to Braze Parts

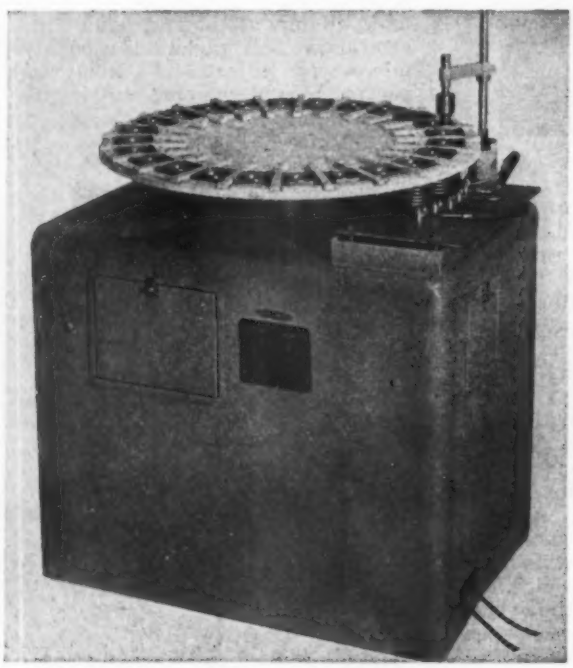
A 24-station circular indexing carrier is manufactured by Scientific Electric, 107 Monroe St., Garfield, N. J., for mounting on one of the company's 18-kw. electronic high-frequency generators to braze metal assemblies. A complete assembly is ejected from the carrier each 12 seconds. The operator's activities are limited to loading the stations as they come around empty. Heat is applied by a set of three water-cooled induction coils located under three of the work positions. The coils are followed by the vertically operating ejecting mechanism. Carrier drive is by a small motor.

Application of the carrier can be made on any of the company's electronic generators with ratings of 5 to 100 kw., depending on the heat-input requirements of the work. Normal output of the unit is at 200 to 600 kilocycles.

Snap-Assembly Method Requires No Screws, Rivets or Welds

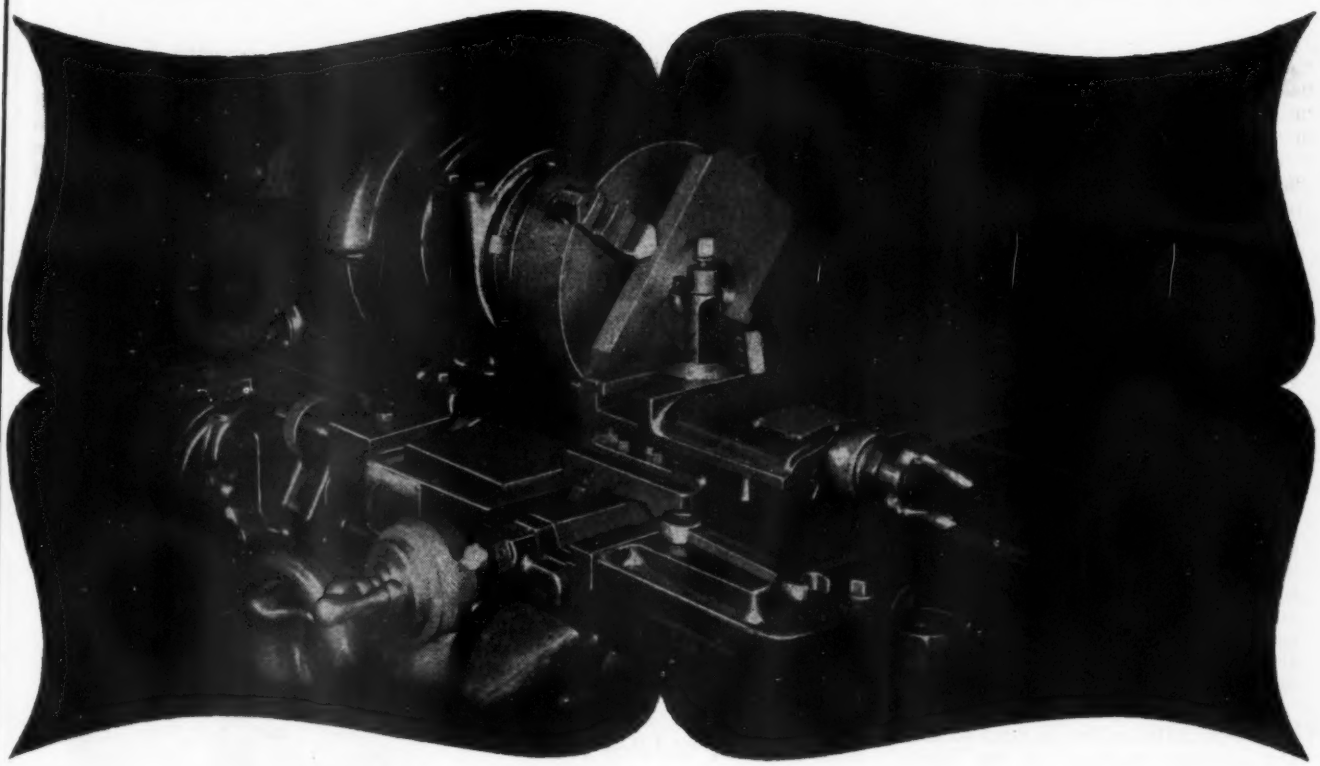
Based on a method of snap-assembly, a prefabricated light metal construction, is manufactured by Lindsay and Lindsay, 222 W. Adams St., Chicago 6, Ill. Fabricated in both aluminum and steel, the Lindsay Struck-Lok consists of three basic parts: framing, sheets, and fittings. All parts are accurately die-formed by mass production methods in a wide variety of sizes. Assembly can be easily handled without special training, as all of the parts snap together by hand, and thus screws, bolts, rivets, or welds are not required. The basic principle of the assembly follows: Special fittings connect the framing and hold it together while the flanged edges of the sheets are snapped into die-rolled frame channels; as the edges of the sheets snap into place they lock framing and sheets permanently into position providing a strong, lightweight unit with no space sacrificed for reinforcing braces.

Lindsay Struck-Lok is available with sheets in 26 and 24 gage steel and 0.020 to 0.030 in thickness of 61 ST alloy aluminum. Perforated or expanded metal sheets can also be used. Openings, louvres, doors, and other conventional construction details are easily incorporated, and the framing can be used to support shelving, hooks, machines, or other equipment. Corner caps and decorative molding also snaps into place to give the completed unit an attractive appearance and cover corner joints.



Scientific Electric 124 station indexing carrier

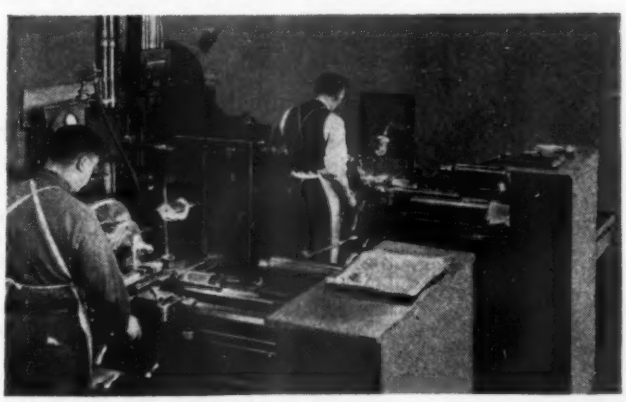
Lindsay Struck-Lok



LODGE & SHIPLEY LATHES at work—

machining THREAD ROLLS AND DIE PARTS

AT OWENS ILLINOIS GLASS COMPANY



● In the great Glassboro plant of Owens-Illinois Co., Lodge & Shipley Lathes are used for an impressive variety of operations—performing them all with complete satisfaction.

Illustrated above is an L & S Engine Lathe machining a die part for production equipment used in manufacturing metal bottle closures. And to insure production of dependable closures, accuracy must be sustained from start to finish—beginning with the original die part shown here.

Firms like Owens-Illinois, concerned with high quality standards and cost-cutting output, quickly recognize the advantages of L & S Lathes. It explains why you find more L & S Lathes in most of the nation's leading plants.

Call on L & S Engineers for the latest information on lathe performance. For detailed literature, write on your company letterhead for booklets on any of the following:

● Engine Lathes ● Tool Room Lathes ● Manufacturing Lathes ● Gap Lathes
● Duomatic (Automatic) Lathes ● Hollow Spindle Lathes

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

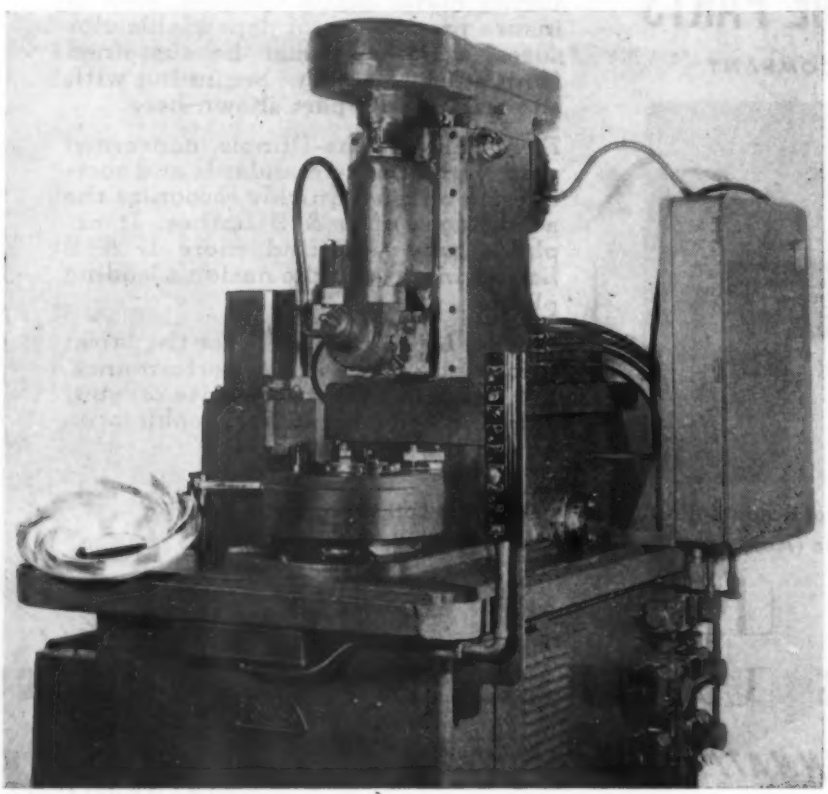
L & S LATHES

Special Profile Miller Finishes Diffuser Parts in Three Cycles

Special profile millers for three consecutive operations on aircraft diffuser parts are made by the Snyder Tool and Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. In the first operation a vertical two-spindle end-milling machine is used to mill a radius on each end of the diffuser vanes. The part is located and clamped on a Geneva index table. On each individual cycle, one vane is machined on both ends. The end mills used are installed on an eccentrically mounted quill housing which rotates through nearly 180 deg. The two-spindle head, motor and spindle drive mechanism slide into position hydraulically and are supported by two guide bars. This machine is essentially a Snyder standard 3 V 14 drilling machine with special eqiupment.

In the second operation a vertical single-spindle miller is used to mill the outside contour of the vanes with side milling cutters set at an angle to the vertical spindle housing center line. In addition to the three feeding motions—feeding the cutter down, moving the entire slide in and out and rotating the table at feed rate—it also is necessary to keep the cutting edge of the milling cutters tangent to the various radii which make the contour of the vane. Therefore it was necessary to rotate the spindle housing angularly in correspondence to the in-and-out movement of the main slide. The mechanism to the left of the cutter housing performs this function.

In the third operation a single-spindle vertical end miller is used to mill the inside contour of the vanes. After rapid advance into the work, the single-spindle housing is raised by cam mechanism to conform to the contour of the vane. The part is rotated at feed rate through an arc and the vertically feeding spindle housing also is moved in and out through cam action. All three actions of the feed mechanism—feeding the cutter up and down, moving in and out and rotating the part—are mechanically synchronized.

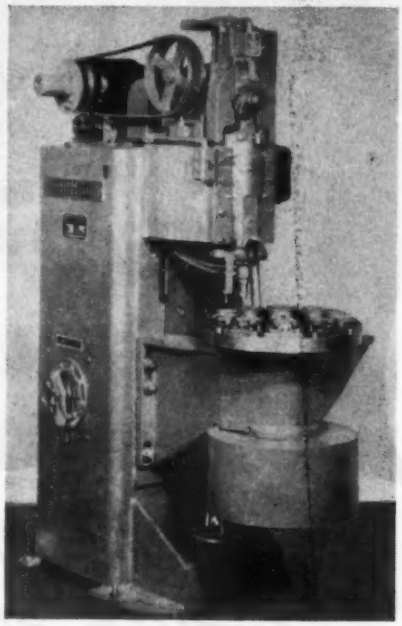


Snyder profile miller

Dial Feed on Welding Press Speeds Metal Parts Assembly

A welding press with a ten-station dial feed for welding at the rate of 15 to 45 pieces a minute is manufactured by the Thomson-Gibb Electric Welding Co., Lynn, Mass. The parts are dropped into the dial pockets and fed around for the welding operation.

Transformer capacity may be 30, 40, 50 or 75 kva. Throat depths may be 12, 18, 24 or 30 in. The sliding head is actuated by a special cam designed to slow down the electrode as it approaches the work and avoid hammering. Pressures may be applied by adjustable spring or air lock



Thomson welding press

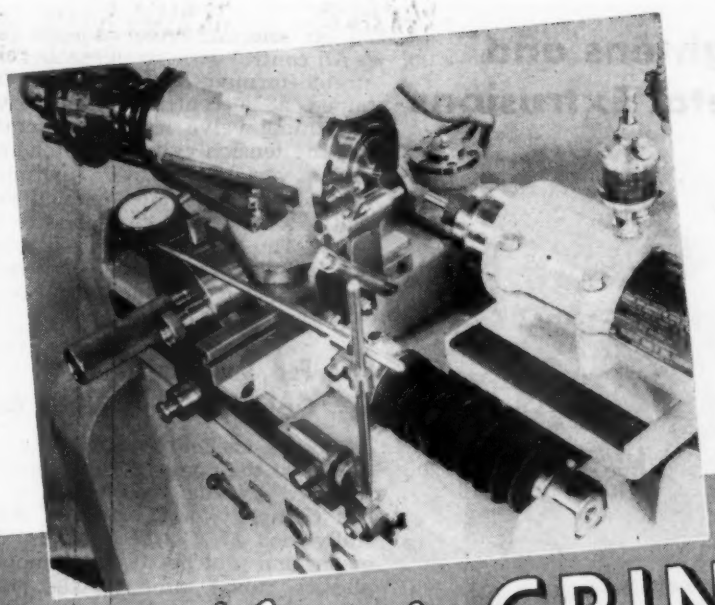
or straight air pressure may be employed. Lower arm can be column or apron mounted or a lower knee and flat upper terminal pad can be used. Interchangeability of these parts makes it possible to adapt this Welding Press to a variety of spot and projection welding operations.

Electric Salt Bath Furnace Heats Long Work Vertically

An internally heated electric salt bath furnace designed for heat treating, in vertical position, long broaches and similar parts which are likely to distort when heat treated horizontally, is built by Upton Electric Furnace Div., 7450 Melville, Detroit 17. The depth is 81 in. while the surface is only 9 in. square.

The electrodes enter through the sides of the furnace and at the bottom of the pot. Thus, with no space required for electrodes in the working area of the pot itself, the pot need be only of sufficiently large surface area to admit the work.

While a temperature drop of 4 F., just enough to actuate the "on" and "off" controller, can take place at the bottom of the pot, the molten salt at the top of the pot remains at constant temperature. When long pieces of cold work are introduced into the bath, there is a uniform drop in temperature through the bath.



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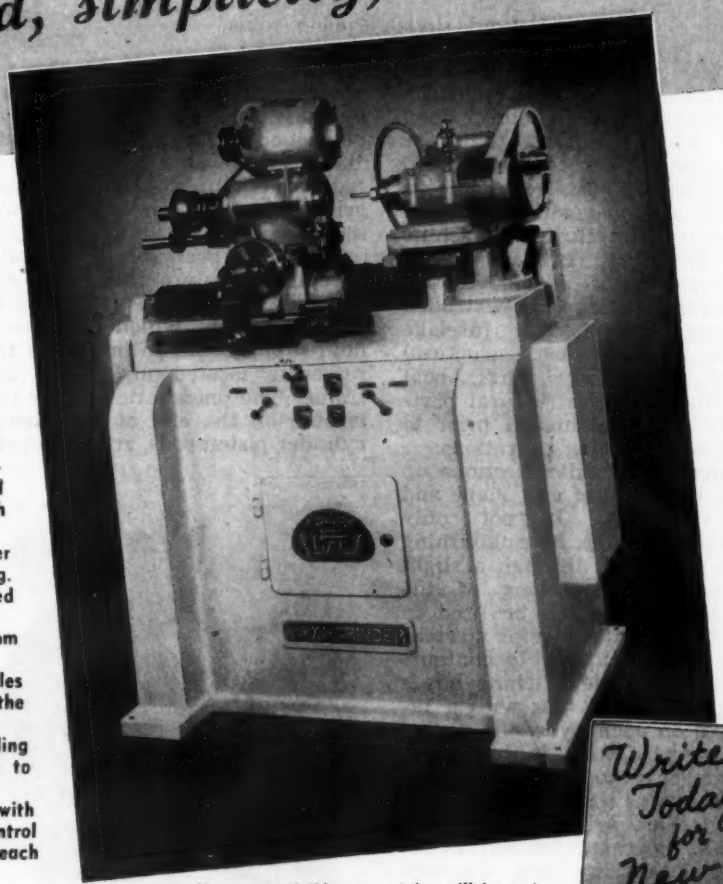
A GREAT STEP FORWARD IN INTERNAL GRINDER DESIGN!

AMAZINGLY ACCURATE!

New Maxi-GRINDER features Unusual Design . . . Developments offer combined speed, simplicity, wide range



These features make the Maxi-Grinder outstanding as a fast, precision internal grinder:

Grouping of operating controls is such that operator's right hand is free to load and unload work.

Closing and opening of collet is entirely automatic . . . operated with a cam and lever arrangement.

A motor driven mechanical differential unit drives the ram in which the grinding spindle is mounted . . . positively eliminates bell-mouth holes. Length of stroke is easily adjusted, making it adaptable to grind shoulder and blind holes; has six speeds, can quickly be slowed with speed control switch for wheel dressing.

Diamond wheel dresser has a micrometer feed, quickly adjusted for automatic hole sizing.

Hardened, ground and lapped ways are sealed against dust.

Feeding mechanism is absolutely free from backlash and is totally enclosed.

Setting up to grind taper and angular holes is simplified by use of a built-in sine bar on the work head (see above close-up).

Dust collecting system draws off all grinding dust, prevents clogging, glazing and adds to wheel life.

All functions are performed mechanically with electric motor power and push button control . . . a separate motor being used for each operation.

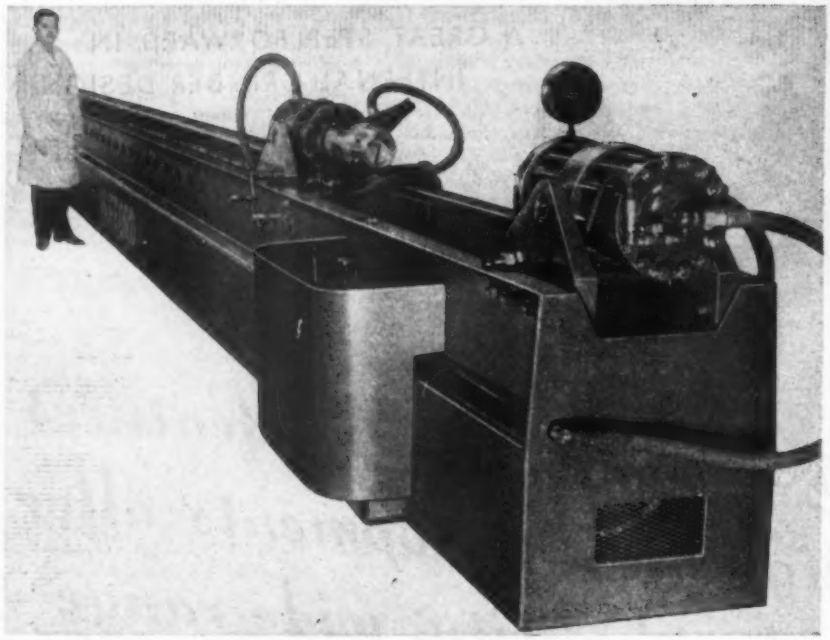
Write Today for New Catalog

Your copy of this new catalog will be sent immediately on request. Write . . . get acquainted with this newer, better method of internal grinding.

WILSON MACHINE PRODUCTS DETROIT WMP

Wilson Machine Products 1231 BEAUFAIT AVE. DETROIT 7, MICHIGAN

Hydraulic Machine Straightens and Stretch-Forms Metal Extrusions



Hufford stretch-leveling table

Developed for permanently straightening and leveling long narrow metal sections that are twisted, bent or otherwise distorted after rolling or heat-treatment, an hydraulic stretch-leveling table is manufactured by Hufford Machine Works, 207 North Broadway, Redondo Beach, Calif. It is useful for straightening rolled and extruded metal used for aircraft fuselage stringers, railroad car structural members, bus body parts, boat frames and similar structural parts that must be straightened prior to forming or degreeing operations.

The machine handles sections up to 40 ft. in length of any shape and many materials. It not only straightens the stock by establishing a set in the metal through a slight pre-determined stretching of the material, but also can be used in conjunction with a die for stretch-forming the workpiece to contours up to 30 deg. The machine has a pull capacity of 40 tons with a 19-in. stroke on each hydraulic piston, but it can be built in higher or lower capacities to meet the varying requirements of straightening work.

The machine consists of two hydraulically-operated tension cylinders mounted in steel brackets which in turn are attached to a long steel bed. The tension cylinder at the control end of the table is stationary, while the opposing cylinder is adjustable along the length of the table in 5-in. increments to accommodate various workpiece lengths. Both cylinders tilt upward to a maximum of 30 deg. for stretch-forming work and are actuated and positioned by means of small auxiliary cylinder assemblies. The piston rods are equipped with air-operated gripper jaws which hold the work securely.

Hydraulic pressure for operating all cylinders is provided by an electric motor driving a vane-type hydraulic pump which obtains its fluid supply from an integrally built reservoir located inside the table frame. The pneumatic gripper jaws, located on the end of both tension cylinder piston rods, are operated by an air selector valve on each jaw.

All control over straightening and stretch-forming operations is maintained at a central control panel containing valve levers for actuating the tension cylinder piston rods and a variable sensitive hydraulic control which permits manual regulation of the tension applied to the work. The adjustable tension cylinder can also be operated by remote controls located on the assembly.

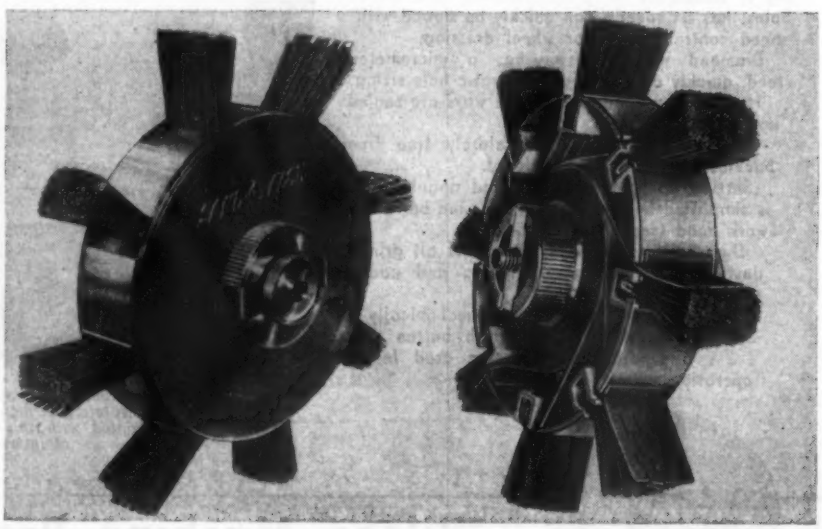
Strip-Fed Sanding Wheel Cushioned With Brush Back

A brush-backed sanding wheel known as the Sand-O-Flex is manufactured by the Exactone Tool & Die Company, 4373 Melrose Ave., Hollywood 27, Calif. It sands, deburrs and finishes woods, metals, plastics, rubber products and other materials.

The device consists of a central magazine which houses the strip abrasive. Eight of these strips extend through the housing and are held against the work by tough bristles. The bristles cushion the abrasive, making it possible to get in and around corners, hollow and fluted surfaces, and small openings.

The body and cover of the Sand-O-Flex are cast from Zamak. Overall diameter (including brushes) is approximately 8 in. Weight, fully loaded, is about 2¾ lb. Normal loading contains 20 ft. of abrasive and reloading is done simply by unscrewing the serrated nut and removing the cover. A wide range of abrasives of various grits and grades are supplied for use with the sander. These cartridges, plus the quick-changing feature, permit the same tool to be used in operations from rough stage to polished surface.

It fits all standard ½ and ⅝ in. motor shafts, stationary or flexible, or can be supplied to fit any shaft



Sand-O-Flex sanding wheel

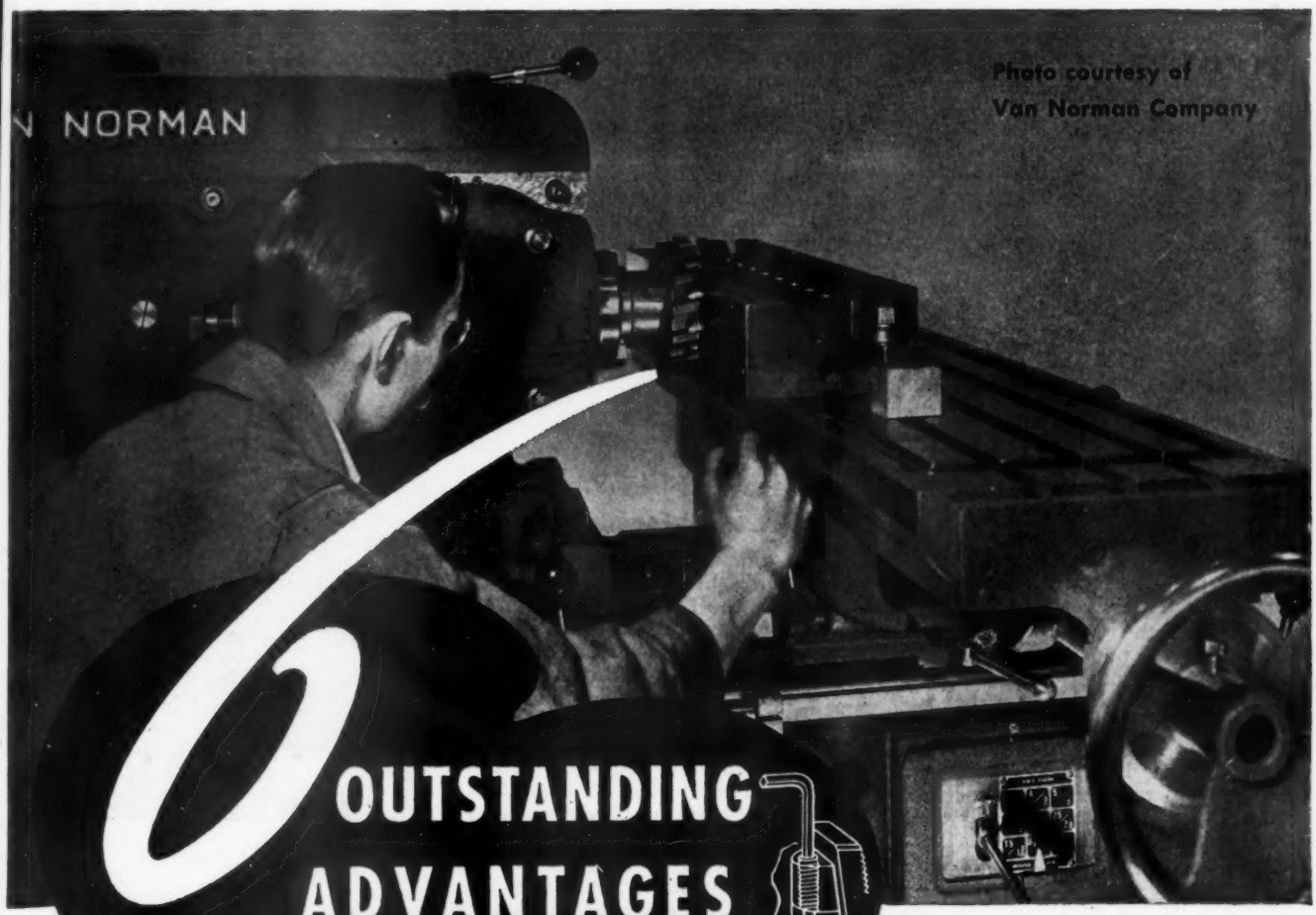


Photo courtesy of
Van Norman Company

6 OUTSTANDING ADVANTAGES

of McCrosky *Jack-Lock Milling Cutters

* Patented

1 RIGIDITY—Jack-Lock tools have the rigidity of solid tools. The blades *can not* work loose under the thrust of the cut.

2 EASY BLADE RELEASE—Simply retracting the screw releases the wedging pressure. No hammering or pounding to damage the blades or cutter body.

3 ACCURATE ADJUSTMENT—Fine pitched screws in back of each blade assure positive, extremely uniform blade adjustment.

4 MINIMUM BLADE LOSS IN REGRINDING—a result of uniform and accurate blade adjustment: more grinds per blade, a special advantage on carbide-tipped jobs.

5 FEWER TOOLS NEEDED—Because the tools can be adjusted and ground more quickly, and with greater accuracy, fewer cutters are required to keep a job in continuous production.

6 WIDE RANGE OF SIZES—Including face, shell end, half-side and staggered tooth cutters, 3″ to 20″ in diameter.

If you don't have full details about this shop-proved line—standard for 40 years—send for Bulletin 16-M. Do it today!

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS — *Block Type* BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS — *Turret* TOOL POSTS

size on request. Motor speed of 1,750 r.p.m. is recommended, decreasing in proportion to the coarseness of the abrasive used and according to the results desired. No particular skill is required to operate it, nor is much pressure necessary to obtain a good finish. Light in weight, the sander is suitable for use on a flexible shaft.

Multiple Unit Stud Welder Increases Fastening Speeds

An automatic stud welding production unit is manufactured by the Nelson Specialty Welding Equipment Corp., 440 Peralta Ave., San Leandro, Calif. Using this unit, two or more studs may be welded in one operation. The work is rapidly performed and the studs are held to close tolerances.

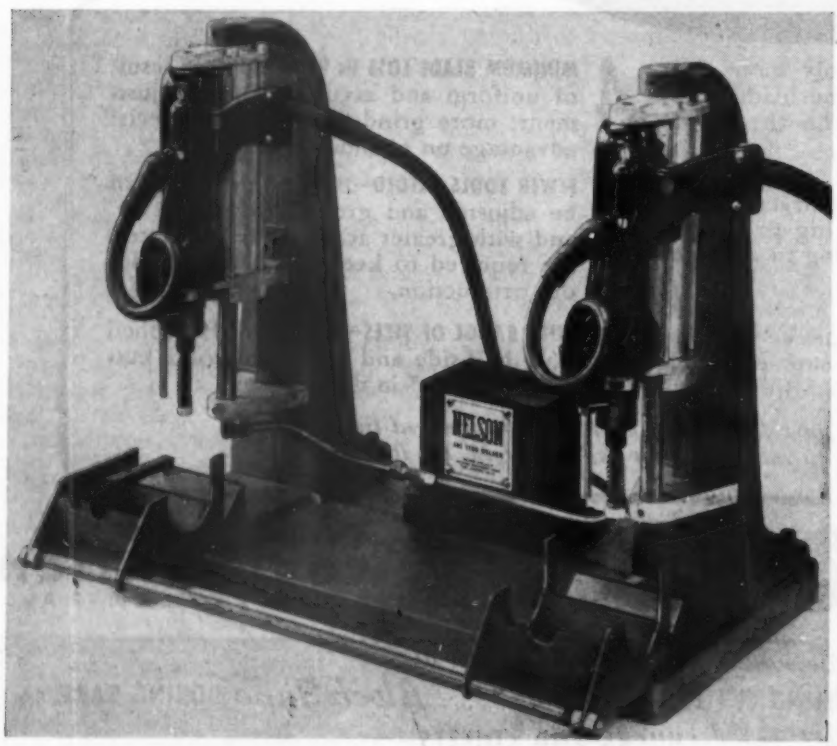
Each of the welding guns is mounted on a pneumatic air cylinder. Each cylinder is fixed to a movable arbor which can be adjusted to any spacing necessary for the work. The air controls to the cylinders are interlocked to cause the guns to operate in consecutive order. This permits the use of a small generator. The work is held in a mandrel, chuck, or special locating device—the setup being determined by the particular production problem at hand. The welding current is obtained from a conventional 400-amp. generator, and is regulated by a timing control unit which automatically controls the length of arc flow, producing controlled and consistent welds. The multiple welding unit is operated with a single control switch.

The work is inserted, a stud is fitted into the chuck of each stud welding gun, and the control switch pressed. The first gun then descends making a weld. Upon completion of this weld the next gun descends and welds. The guns then ascend automatically and the work is removed. Each production unit is manufactured only on order to permit the unit to be made to fit the particular problem.

High-Speed Hydraulic Presses Developed For Nosing Shells

Of 500-ton capacity, a hydraulic press with a bed area of 40 x 37 in. is built by the E. W. Bliss Co., 53rd St. and 2nd Ave., Brooklyn 32, N. Y. for nosing 8 in. shells. It is equipped with a 400-hp. pump unit to provide a 5½ sec. pressing cycle. This fast cycle prolongs die life and insures production uniformity as contact of the dies with the hot work is reduced to a minimum. To aid fast operation the reversal is controlled by four-way valves that are arranged to permit a shockless reversal.

The press stroke is 24 in. Closing speed is 600 in. per min., pressing, 190 in., with reversal at 650 in. per min. Loading and unloading devices operating in automatic sequence may be provided to reduce ineffective handling.



Nelson multiple stud welding unit

Magazine Feed Torque Wrench Has Adjustable Torque Control

Adaptable to any type of nut including stop and cap nuts, a magazine feed nut is manufactured by the E. Z. On Co., 9551 Grand River, Detroit 4, Mich. Located in the handle, the magazine delivers one nut at a time to the drive end. The wrenching torque applied through the driver can be adjusted to provide any pressure within the capacity of the tool. Any air or electric drive unit can be used to provide power for the tool.

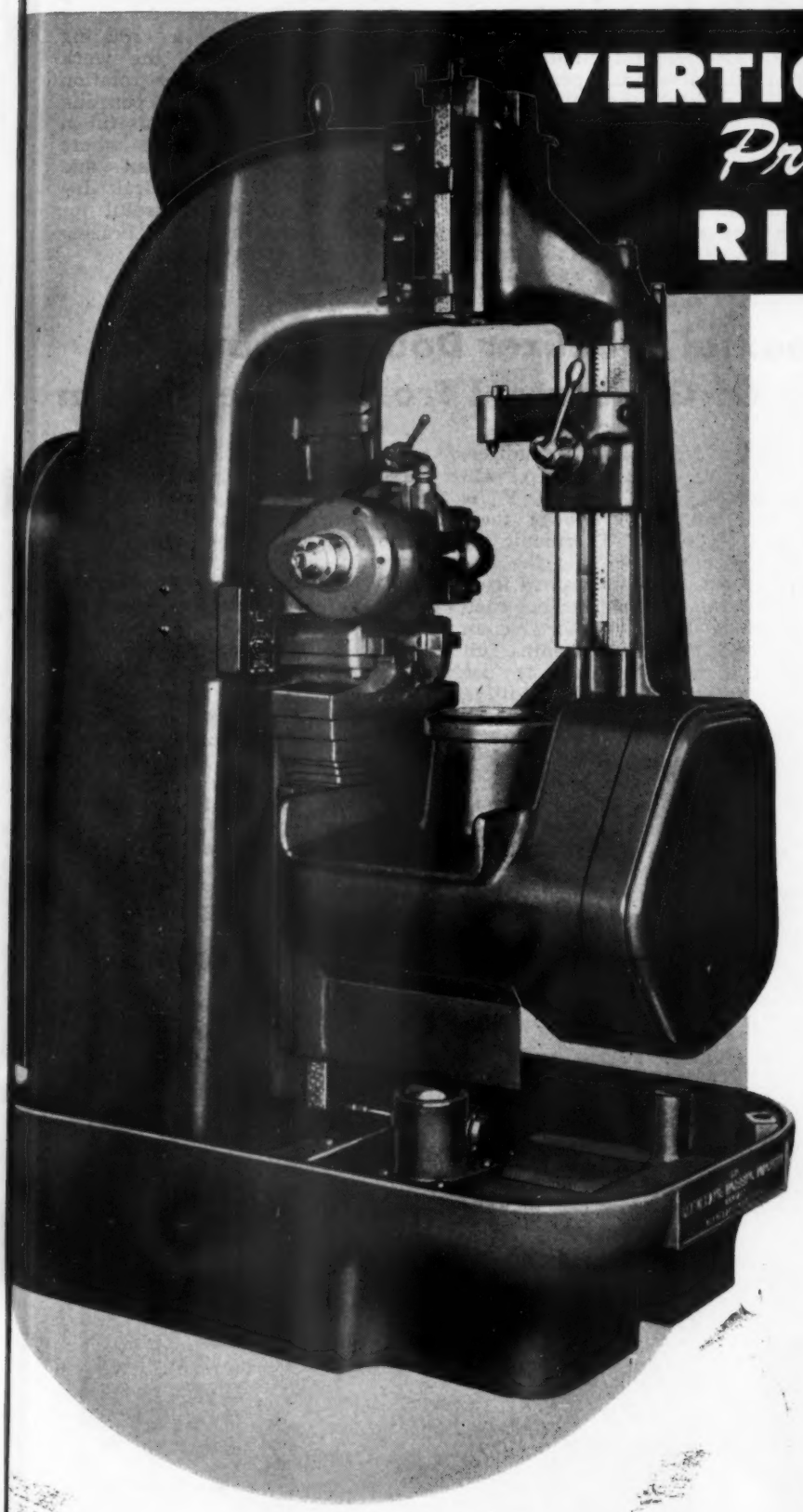
E.Z. on nut runner

Emulsifying Degreaser Cleans, Brightens Aluminum Alloys

G-Bex C, an emulsifying degreasing compound, is manufactured by Gaybex Corp., Nutley 10, N. J. The degreasant is prepared ready-to-use and contains no free alkalies. Although it may be used safely on ferrous metals and many plastics, its qualities are especially blended to handle the degreasing and brightening of aluminum and white metal alloys. Industrial hazards have been considered in its preparation. The flash point (A.S.T.M.) is 165 F., and the compound may safely be handled without toxic effects. Its odor is slight, pleasant and disappears rapidly.

Parts and surfaces can be dipped in or sprayed with G-Bex C, then thoroughly rinsed with clear water. Instant emulsification results. The action of this compound is to dissolve grease and oil, loosen dirt and reduce oxide stains. No powder or harmful residue remains after the water rinse. It is available in 54 gal. and 7½ gal. drums.

THE RIGIDHOBBER



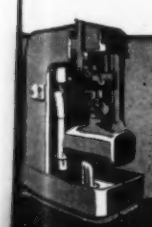
VERTICAL FEED *Provides* RIGIDITY

● The Rigidhobber design being VERTICAL incorporates a moving workhead and stationary hobhead. This design gives both units positive support during entire cutting operation and is universally recognized as providing the maximum rigidity.

Another advantage of Vertical design is that chips naturally fall away from the hob and work spindle.

For the accurate, rapid hobbing of gears and splines at low cost, investigate the Rigidhobber.

Complete information is contained in Rigidhobber booklet. Write for one.



The CLEVELAND HOBBING MACHINE Company

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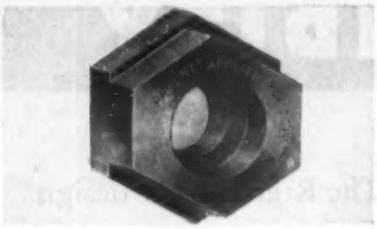
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

Universal Milling Fixture Key Fits Three Table Slot Widths

Two sizes of specially shaped milling fixture keys made by the Vlier Manufacturing Co., 4552 Beverly Blvd., Los Angeles 4, Calif., will fit a total of six different widths of milling machine fixture slots. Each



Vlier milling fixture key

key is cut with six sides, the distance across the flats varying, in the small size, to fit 9/16, ½ and ⅝ in. widths of slots. The large size fits ¾, 11/16 and ⅝ in. slots.

Induction Heating Work Table Has Circuit Control Timers

A single-position, general-purpose work table manufactured by the Induction Heating Corp., 339 Lafayette St., New York, N. Y., can be used for any induction heating application. It is equipped with a standard Thermonic output transformer mounted to effect interchangeability from one type transformer to another. The table contains water piping for spray quenching, a solenoid-operated valve and a quench flow regulator for controlling the timing and volume of quench. One control circuit timer controls the quenching period, and the other controls the delay period from the end of the heating cycle to the start of the quench cycle. Control buttons for the Thermonic generator and pilot light indicators are mounted on the front of the table.

Mounting panels on the front panel support output leads from the transformer. The leads have interchangeable pressure fittings for facilitating work coil connections. Accessory equipment includes a rotating spindle mounted below the work coil and quench ring for rotation of the work during the operating cycle. This is particularly useful in gear-hardening applications where automatic control of heat and quench cycles are economical. Interchangeable coils are useful for many heat-treating and brazing operations of short runs.

Coaxial Equalizer Doubles Output Of Generators From Single Station

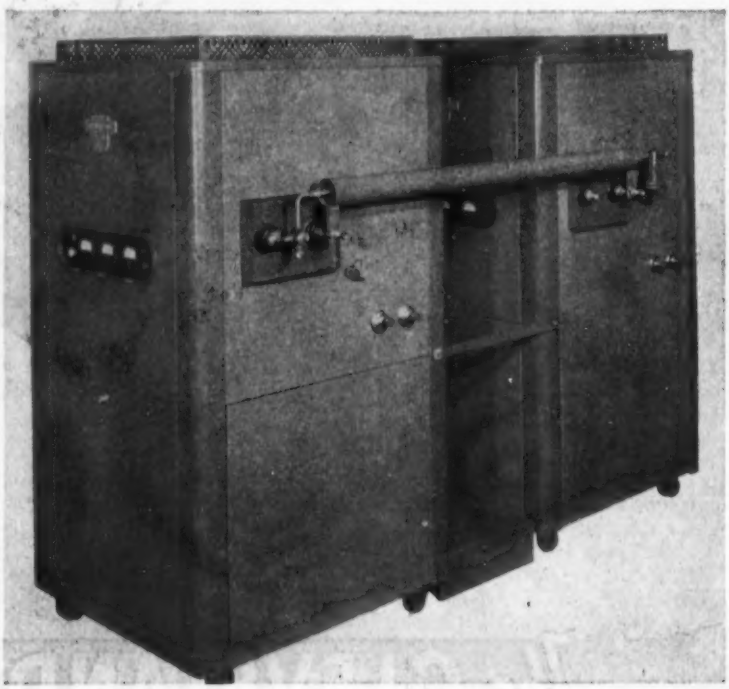
By use of the coaxial equalizer, the Induction Heating Corp., 339 Lafayette St., New York, N. Y., is now able to couple two of their standard Model 1070 Thermonic induction generators so that the full output of both can be obtained from a single set of terminals. Since each of the Model 1070 generators has an output of 1070 B.t.u. per min., full 40 kw. of power is available for use in any desired application with a single control station operating the tandem generator set-up.

The installation of the coaxial equalizer (made up of concentric tubular conductors) requires only the connection of the equalizer to the output terminals of the generators. An additional interconnection is made between the power sections of the generators to give electric stability. The equipment can be operated single phase, two-phase or three-phase, making it possible to install the equipment from any power supply with the full load power factor at approximately 90 percent.

The Model 1070 Thermonic induction generators can be operated separately, each having an output of 20 kw. or less, and permit larger work to be accomplished when necessary.

The Model 2200 Thermonic set-up, having an output of 40 kw. can surface harden eight or more square inches of material in a single heating cycle. Its production output can be greatly increased by using progressive heating methods where small sections are heated and the work progressively moved through the heating coil to suitable quenching arrangements.

Thermonic work table



Thermonic coaxial equalizer

...cut floor-to-floor time to 12 seconds.....

Tapping an .800-16 Class-3 fit thread to a critical depth of exactly 5/8 inch from the nose of a smoke shell and concentric with the bourrelet of the shell, in 12 seconds each, floor to floor, is the job being done by the Detroit Tap & Tool Company engineered installation shown here.

Taking advantage of the light weight of the shell, permitting its handling with one hand, "Detroit" engineers designed a simple fixture which locates and clamps the smoke shell both concentrically with the tap spindle and to exact height of the shell nose—*with but a single movement of one lever.*

Thus, loading and unloading time was cut to the minimum possible, taking maximum advantage of the ability of the Detroit LTM lead-screw type tapping machine to turn out more accurate work in greater production. The drive to the tap in these machines is at the base of the lead-screw, eliminating wind-up and permitting fast return with greater thread accuracy.

For further details, ask for Bulletin LTM-44.

BUY U.S. BONDS STAMPS

DETROIT
TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A.

Portable Developing-Printing Unit Takes Roll Stock or Cut Sheets

Bruning model 41 printer

The Model 41 printer for black and white prints, manufactured by the Charles Bruning Co., 4754 Montrose, Chicago 41, Ill., has a printing speed range up to 6 ft. per min., depending on the transparency of the original, printing either roll stock or cut sheets with a printing width of 46 in. The light source is a 2,000-watt glass mercury vapor lamp within a 6-in. diameter cylinder, assuring uniform distribution of light over the entire printing area. The air is drawn into and through the cylinder and contact bands to maintain minimum machine temperature. Uniform cylinder temperature within a few degrees is maintained.

Printing speed is controlled by a single knob, easily read dial, located within convenient reach of the operator. Suction through the bands simplifies feeding of tracings and sensitized paper and the tangential method of feeding assures safety to the tracings and eliminates pinching or catching. Tracings and prints are removed without scraping, thus insuring long cylinder life. A front foot pedal releases band tension instantly so that mis-feeding of roll stock can be corrected.

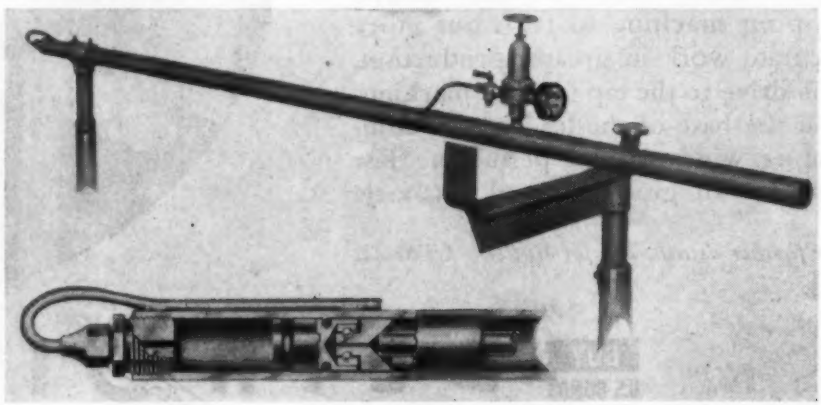
Speed, contact and development controls are easily removed for cleaning. All parts in contact with the developer are of stainless steel or are non-metallic. Mounted on four casters, the printing-developing unit can be moved to and operated in any desired location. No plumbing connections are necessary.

Pneumatic Feed Loads Bar Stock With Uniform Pressure

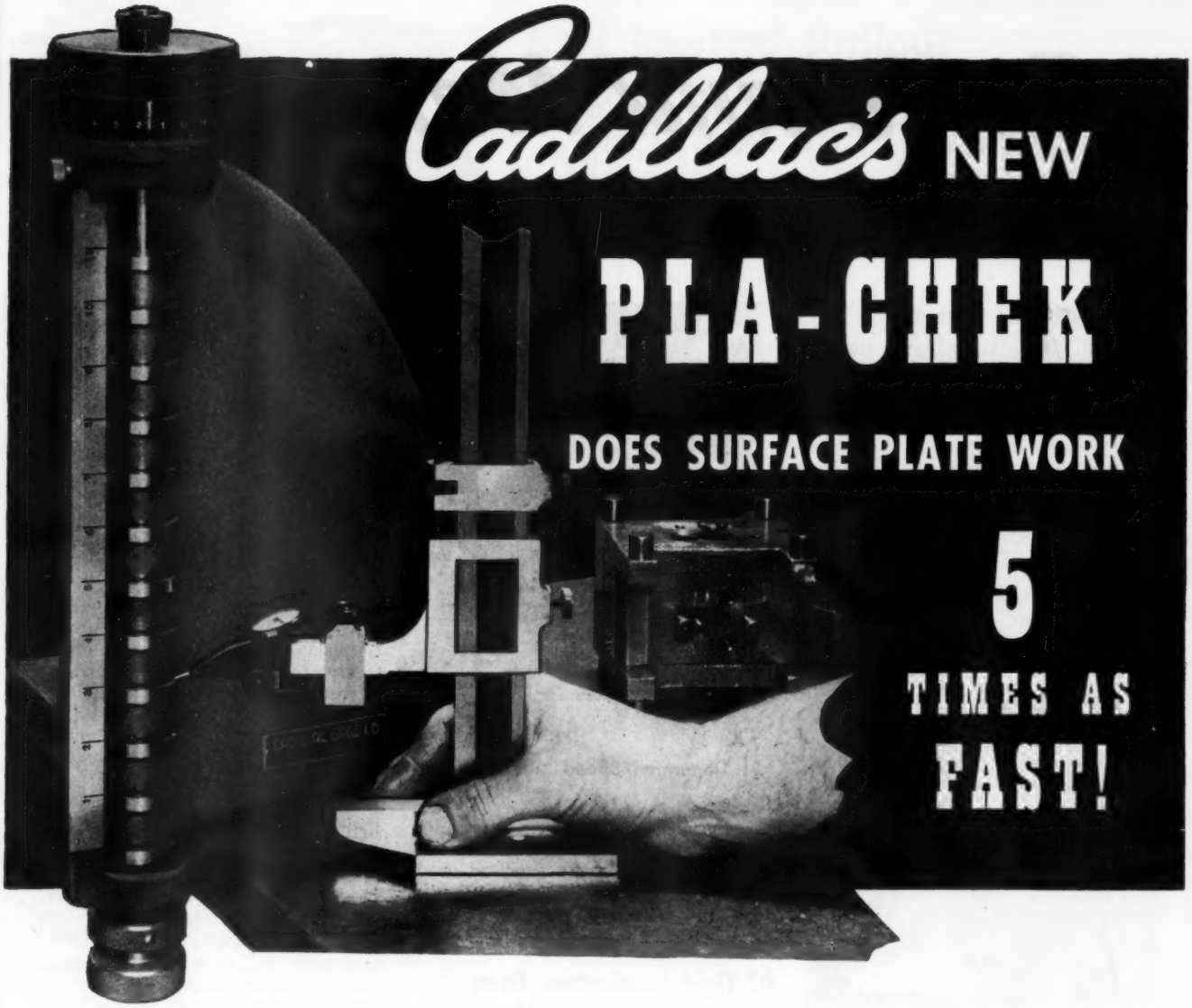
A pneumatic bar feed is manufactured by the Newton Manufacturing Co., 215 West Seventh Street, Los Angeles 14, Cal. Made in seven sizes to take bar stock from 6 to 11 ft. lengths, the Newton bar feed is a complete unit ready for use, including stands, seamless tube, pressure regulator and piston.

The airline connects to the pressure regulator, delivering pressure to the far end of the stock tube and actuating the piston, which pushes the stock into the lathe and against the stock stop under uniform pressure. This eliminates length rejections caused by the variations of pressure inherent in mechanical and hand-feeding of stock. The pressure regulator, in full sight of the operator at all times, is adjusted for various stock weights.

Noiseless stock feeding is accomplished by the piston, the forward end of which is of inverted cone shape mounted on end-thrust ball bearings, which centers the stock and turns with it thereby holding it away from the feeder tube. The piston has carbon-impregnated Neoprene rings which seldom require renewal to retain satisfactory air pressure in the feeder tube. Stock is loaded in the bar feed attachment, by releasing the tube lock by a turn of the hand knob, swinging the tube over on the slide bracket, inserting the bar stock, returning the tube to position and locking it.



Newton bar feed



WITH Cadillac's new Pla-Chek you can get out five times as much surface plate inspection work as you do now—and it will be accurate because Pla-Chek is guaranteed accurate to .00005″.

Pla-Chek is a hardened steel bar with 12 steps spaced exactly 1″ apart; a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001″ on the upper end of the bar and a simple triangular-shaped support bracket.

With this bracket set on a conventional surface plate and the micrometer thimble set at zero, the lower end of the bar is exactly level with the surface plate.

The micrometer is then set for the desired dimension in thousandths and tenths of thousandths and the measurement is taken from the desired inch step. Measurements are guaranteed accurate to .00005″ for any size from .001″ to 12″ from the surface of the plate.

TWO WEEKS FREE TRIAL

So that your inspectors can see how much time Pla-Chek will save them, we will send it on two weeks free trial. If this trial satisfies you, send your check, if not, return Pla-Chek express collect and you owe us nothing.

Cadillac GAGE COMPANY

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Parts and Materials

Air-Fed Welding Helmet Boosts Welder's Output

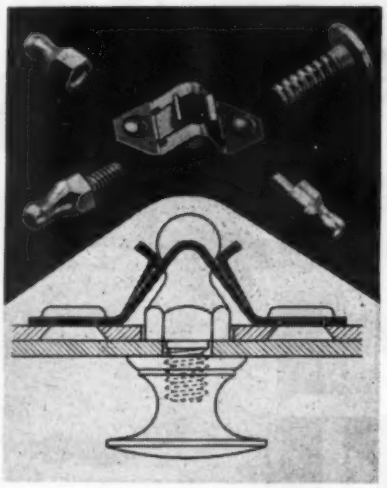
To give welders complete relief from obnoxious fumes, an air-fed welding helmet is manufactured by the Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 11, Ill. After tests in many plants, it is reported that the helmet reduces worker fatigue and improves worker morale. Production increases also result, the tests showed.

Clean fresh air is fed into the helmet through a supply tube encircling the lens holder. Air flows along the shell and travels to every outer edge. Air constantly circulates within the helmet, but drafts are eliminated. The directional flow of the fresh air prevents stale or fume-laden air from entering. Heat is cut down and welders work in comfort under all conditions.

Cesco "Air-Flow" helmet

Spring Steel Latch for Quick Removal of Doors or Panels

A spring steel Speed Nut Latch has been developed by Tinnerman Products, 2113 Fulton Rd., Cleveland 13, O. for instant attachment and removal of box covers, access doors, panels and inspection plates. The spring arms of the Speed Nut snap over ball or grooved studs to provide firm attachment, yet studs may be quickly withdrawn. It is available in five material thicknesses to provide the desired degree of pull-out tension. Three styles of ball studs are available: drilled and tapped for 6-32 screws, threaded shank and plain shank for riveting. These, as well as the grooved stud, are provided in various lengths to suit application requirements.



Tinnerman Speed Nut Latch

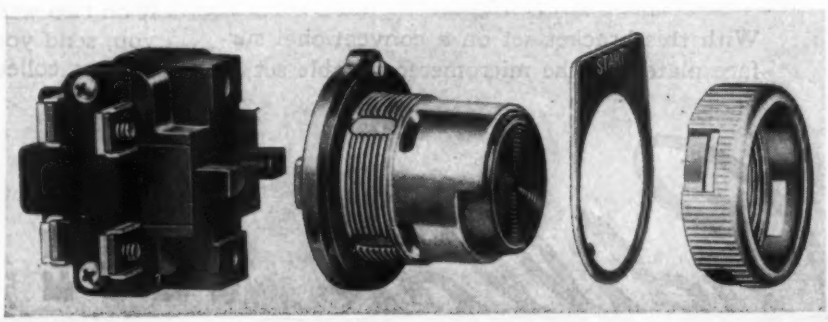
Oil-Tight Pushbuttons Have Interchangeable Mechanisms

Oil-tight pushbuttons, designed primarily for group mounting on machinery or control enclosures, are manufactured by the Square D Co., 4041 N. Richards St., Milwaukee 12, Wis. Field and laboratory tests were conducted to prove the oil-tightness of the units. Tests were made with oils, coolants and cutting compounds under more severe operating conditions than those encountered in actual use. The pushbuttons have been designed to provide switching mechanisms and switch operators that are interchangeable to permit selection of combinations.

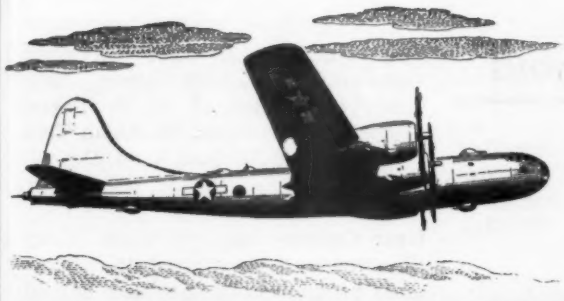
Although the Type T units are more compact and can be mounted on closer centers than previous types, there has been no sacrifice of accessibility. All terminal screws can be reached with a screwdriver without going in at an angle. The unit is inserted through the panel and prevented from turning by a dowel. After the legend plate is slipped on, a thread ring firmly clamps the unit into position. Since the operating mechanism and the contact block are separate units, it is possible to obtain a combination to cover a wide range of circuit requirements with a stock of three types of operators and four types of contactors that are fully interchangeable with all other parts.

Brush Holder Eliminates Machining on Stud Mounts

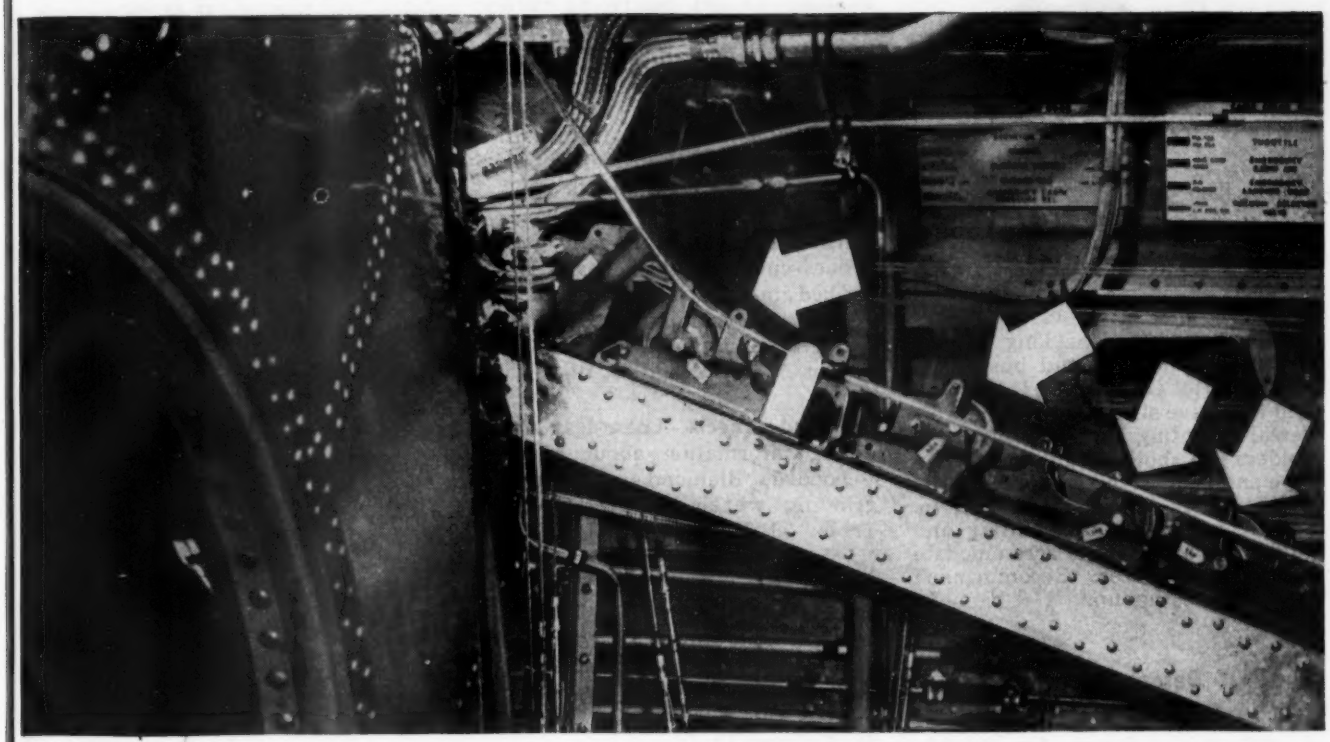
The Publix brush holder manufactured by Publix Metal Products, 100 Sixth Ave., New York 13, has been designed to eliminate difficulties found with brush holders. The clamp mounting on the stud avoids the necessity of close tolerances on stud diameters; this permits the use of commercial bar stock and eliminates the need for grinding or milling the mounting stud. The construction prevents stud marring and allows for ease in removal and replacement. The stop screw prevents the displacement of the brush under shock conditions. The undercut trigger for spring adjustment maintains position under shock and vibration and, to meet service requirements, the slip stud allows rapid spring replacements. The shunt connection is



Square D oil-tight pushbutton



450 Control Pulleys on B-29 Superfortress Ride on Needle Bearings

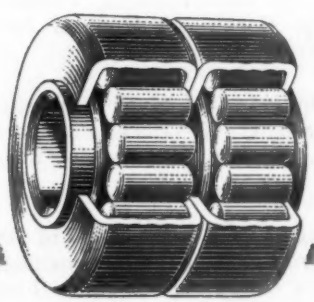


Torrington double-row Needle Bearings assure smooth functioning of B-29 control pulleys.

When you're carrying the world's greatest bomb load higher, faster and farther than any other plane in existence, you want the 450 pulleys your control cables ride on to function smoothly, efficiently, and reliably.

That's why, aboard Boeing's great B-29 Superfortress, each control pulley turns on a Torrington PN type anti-friction Needle Bearing. Torrington Needle Bearings are utilized because they more than meet all the requirements for lightness, compactness, high load capacity, stability, ease of anti-friction operation—*and all-out reliability.*

Detailed data on this and other applications of Torrington Needle Bearings is available for your engineering files. You'll find it helpful in solving many a problem of friction elimination that comes to your drawing board. Send for your copy today.



THE TORRINGTON COMPANY

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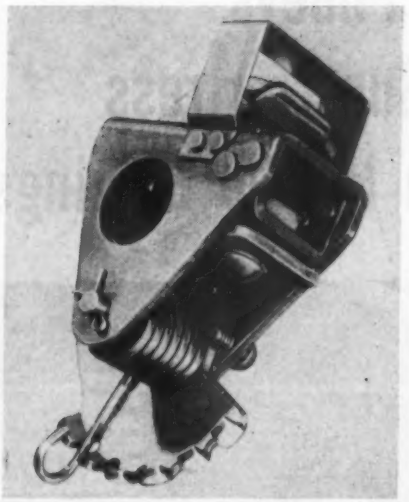
TORRINGTON NEEDLE BEARINGS

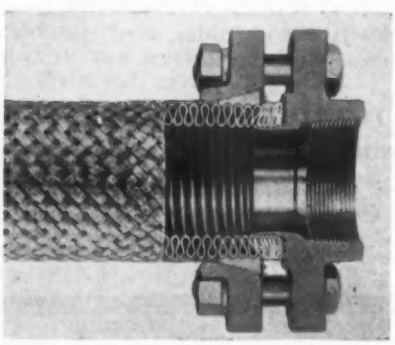


Publix brush holder

easily accessible. The long bearing surface of the slip stud bushing is designed to eliminate trigger rock and excessive slip stud wearing. Universal mounting is possible with the holders on both angular reaction type and radial type mountings. The brush holder is available for ½ in. and ⅞ in. dia. stud mounting and guides are available to accommodate various brush sizes. Recommended for use for ½ hp. up.

Packless Detachable Flange Fits On Flexible Metal Hose

A detachable flange for flexible metal hose has been developed by Packless Metal Products, New Rochelle, N. Y. It has been designed especially to permit repeated re-use. The flange is made gas-tight by the pressure of the split-taper pressure ring which clamps the hose tightly and forces the flat end of the hose into the serrations on the back of



Packless detachable flange

the flange. No gaskets are required in the installation. It is assembled with eight bolts and can be applied without special tools to 2, 2½ and 3 in. hose.

TRADE PUBLICATIONS

Boring Tools—Bulletin 115 describes stock sizes of "convertible" carbide-tipped and solid-carbide boring tools. Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich.

Brazing—Leaflet describing various uses of Easy-Flo solder. Write to Handy & Harman, 82 Fulton St., New York 7, N. Y.

Columbium—Technical information about pure metal. Fansteel Metallurgical Corp., N. Chicago, Ill.

Cutting Tools—How metallurgy improves cutting tool efficiency is described in illustrated booklet, and various tools manufactured are illustrated. Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.

Diamond Wheels—Loose-leaf sheets giving information about resenoid — bonded, diamond — impregnated grinding wheels. Larco Diamond Tools, 36 W. 47 St., New York, N. Y.

Drills—Leaflet "Cutting Tools for Efficient Operations" shows popular sizes of drills, reamers and various cutting tools. Chicago - Latrobe Twist Drill Works, 411 W. Ontario St., Chicago 10, Ill.

Electrodes—Bulletins W-2 and W-3, describe various methods for using "Ampco-Trode" electrodes. Ampco Metal Co., Inc., 1745 S. 38 St., Milwaukee 4, Wis.

Electrodes—Bulletin B6344A is a comparison chart of welding electrodes from many manufacturers. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Electronics—Catalog GEA-4254, push-button units, selector switches, indicating lights; Catalog GES-3303 industrial electronics training material. General Electric Co., Schenectady 5, N. Y.

Foundry Equipment — Air - blast rooms, cabinets and accessories. American Foundry Equipment Co., Mishawaka, Ind.

Furnaces—Folder lists toolroom and small production type furnaces, with data about heat-treating baths. The A. F. Holden Co., New Haven 8, Conn.

Gears—Booklet, in three colors, on right-angle reduction drives. Bulletin 745 is intended for designers. Cone-Drive Division, Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

Gear Cutters—Bulletin C-45, "Gear Shaping and Shaper Cutters" for mass production of spur and helical gears, also Bulletin H-44 "Hobs and Hobbing." Discusses the manufacture of accurate gears. Colonial Tool Co., Windsor, Ontario, Canada.

Grinding—Booklet "Grinding Facts" gives principles for choosing types, grades, and sizes of wheels. The Carborundum Co., Niagara Falls, N. Y.

Handles—Booklet shows many forms of bent wire handles. E. H. Titchener & Co., Walnut St., Binghamton, N. Y.

Labor—Bulletin No. 807, "Improvement of Labor-Utilization Procedures," send ten cents to Superintendent of Documents, Washington 25, D. C.

Metal Hose—Engineering data file, complete manual. Packless Metal Products Corp., New Rochelle, N. Y.

Motor Selector—Data book for product planning. The Dumore Co., Racine, Wis.

Plastics — Manual on fabricating methods for plastics, answers many questions, 136 pages. Celanese Plastics Corp., division of Celanese Corp. of America.

Plastics—Two technical films, No. 1 "Bakelite Plastics—Selecting the Right Thermosetting Molding Material;" No. 2, "Bakelite Plastics—Product Design and Molding Technique for Thermosetting Plastics," Bakelite Corp., 300 Madison Ave., New York 17, N. Y.

Polishing—Leaflet gives dimensions and weights of lathes and backstands. Divine Brothers Co., Utica, N. Y.

Reading List—A revision of the 1936 program for junior engineers covers a wide range of cultural and business subjects for after formal education reading. Engineers Council for Professional Development, 29 W. 39 St., New York 18, N. Y.

Remote Control Units—A seven-page manual describes the standard related units of a remote mechanical

COPPER ON ITS WAY TO PERFECTION... BY REVERE

This picture shows coils of copper awaiting final processing in a Revere plant. It comes glistening from between the finishing rolls true to gauge. It is delivered to you in the form of sheet, strip or roll in the correct temper and finish as specified and in accurate dimensions. We have been rolling copper for 144 years, and being the oldest metal-working firm in the country, know how to do it right.

Today, Revere copper goes to war. It is a vital metal, available from Revere or its distributors on authorized C.M.P. orders.

Some day it will go to you freely for civilian metal work, for radiators, heat exchangers, stamped and spun parts, ducts, kettles and a thousand and one products. Copper is preferred for plant and home equipment and consumer goods because it is so easily cut, formed, worked and soldered; because of its high heat and electrical conductivity, its resistance to corrosion and the readiness with which it may be plated and tinned. In most applications it is so long-lasting as to be permanent.

When the day of reconversion comes, Revere will have few problems in its copper mills. We and Revere distributors in all parts of the country will supply you freely.

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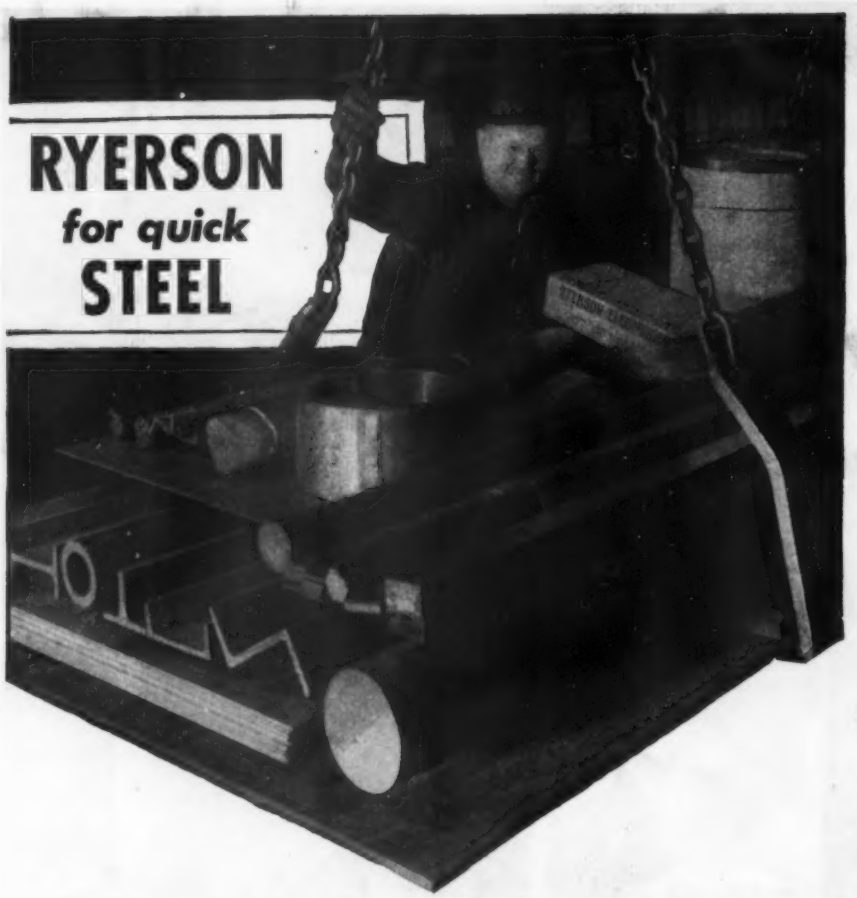

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New York City . . . . . Reetor 2-3700
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Concentrate your steel requirements for hot and cold finished bars, alloy steels, mechanical tubing, Allegheny Stainless, structurals, sheets, and other steel products with Ryerson. Our engineers and metallurgists will be glad to work closely with you. Their experience in selection, fabrication and heat treatment may prove of value to you.

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control system of new design. Special charts are given. Bulletin A-100, M. L. Bayard and Co., 1913 Indiana Ave., Philadelphia 32, Pa.

Resistors—Specifications for resistors with glazed Steatite cores and radiant heaters to 1700 F. Techtmann Industries, 820 Broadway, Milwaukee 2, Wis.

Screws—"Focus on Federal Screw" illustrates contract manufacture of machine screw products and cold-forged parts. Federal Screw Works, 3401 Martin Ave., Detroit 10, Mich.

Shafts, Flexible—Catalog No. 29. 112 pages of 125 types of drives, with 350 interchangeable attachments. N. A. Strand & Co., 5001-5009 N. Walcott Ave., Chicago 40, Ill.

Soap—Uses in modern industry, a bulletin of technical and specialized information. American Soap & Glycerine Producers, Suite 2050, 11 W. 42 St., New York 18, N. Y.

Solders—Silver and gold. Leaflet describes strip, wire, powder, and other forms. D. E. Makepeace Co., Attleboro, Mass., and 30 Church St., New York, N. Y.

Steel—Booklet MS100 Rev. describes five types of steels, giving technical data for heat-treating. Crucible Steel Co. of America, 405 Lexington Ave., New York 17, N. Y.

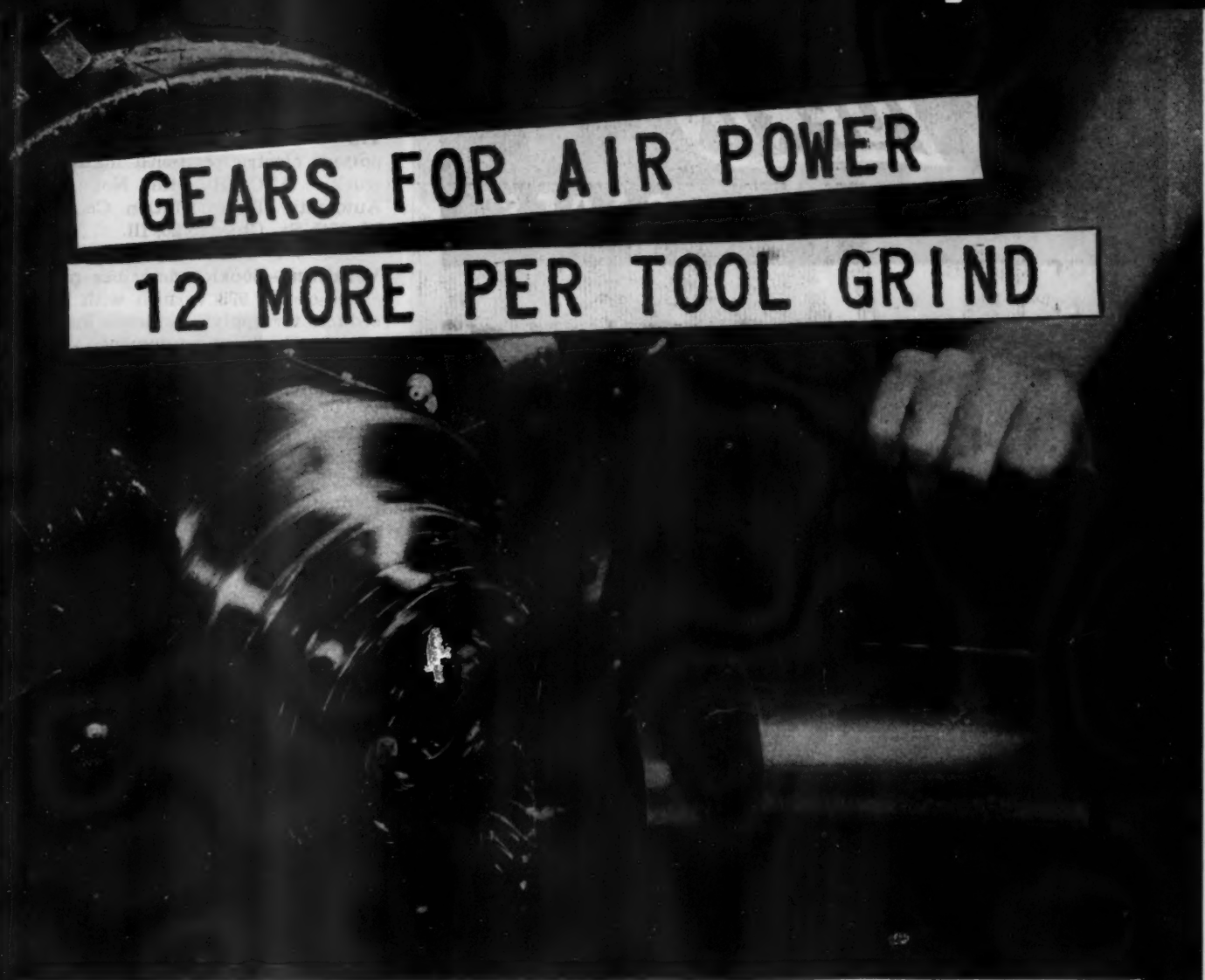
Studs—Leaflet, form 1068A, describes the Rosan locking system. Bardwell & McAllister, Inc., Box 1310, Hollywood 28, Calif.

Transmissions—"Hydraulic Circuits," 28-page booklet, for applications to machine tools and industrial equipment. John S. Barnes Corp., 301 S. Water St., Rockford, Ill.

Transmissions—"As Many as 500 in a Plant," six-page catalog shows many applications to machine tools of speed changer transmissions. Western Mfg. Co., 3400 Scotten Ave., Detroit 10, Mich.

Transmissions—Form 124, describes oil power transmissions for variable speeds. Sundstrand Pump Div., Sundstrand Machine Tool Co., Rockford, Ill.

Trucks—Hyster lift truck, 20 (form 692), 75 (form 694), 150 (form 699), straddle truck series MH (592E), Yardmaster (568F), and Karry Krane (form 693). Hyster Company, 2902 N. E. Clackamas St., Portland



SUNICUT improves finish of gears... tool life increased from 8 to 20 pieces

The outstanding progress of metal working in the aviation industry may be credited to the ready adoption of new and better methods. This is especially true in cutting lubricants!

Short Tool Life and inferior finish were slowing production in a plant machining airplane gears. Several well-known cutting lubricants were used up to seven months ago. Then a Sun Cutting Oil Engineer stepped in, studied operating conditions and recommended Sunicut.

Output increased 150% per tool grind. With Sunicut they increased tool life from a previous average of 8 pieces per tool grind to 20 pieces. Results . . . longer tool life . . . improved quality of finish . . . less time lost for tool resetting.

Experiences of operators of machine tools prove the production value of Sunicut — developed to make tools hold their edges longer, cut faster and produce better finishes. Put this transparent, free-flowing, sulphurized cutting lubricant to work in your shop. Write for details to . . .

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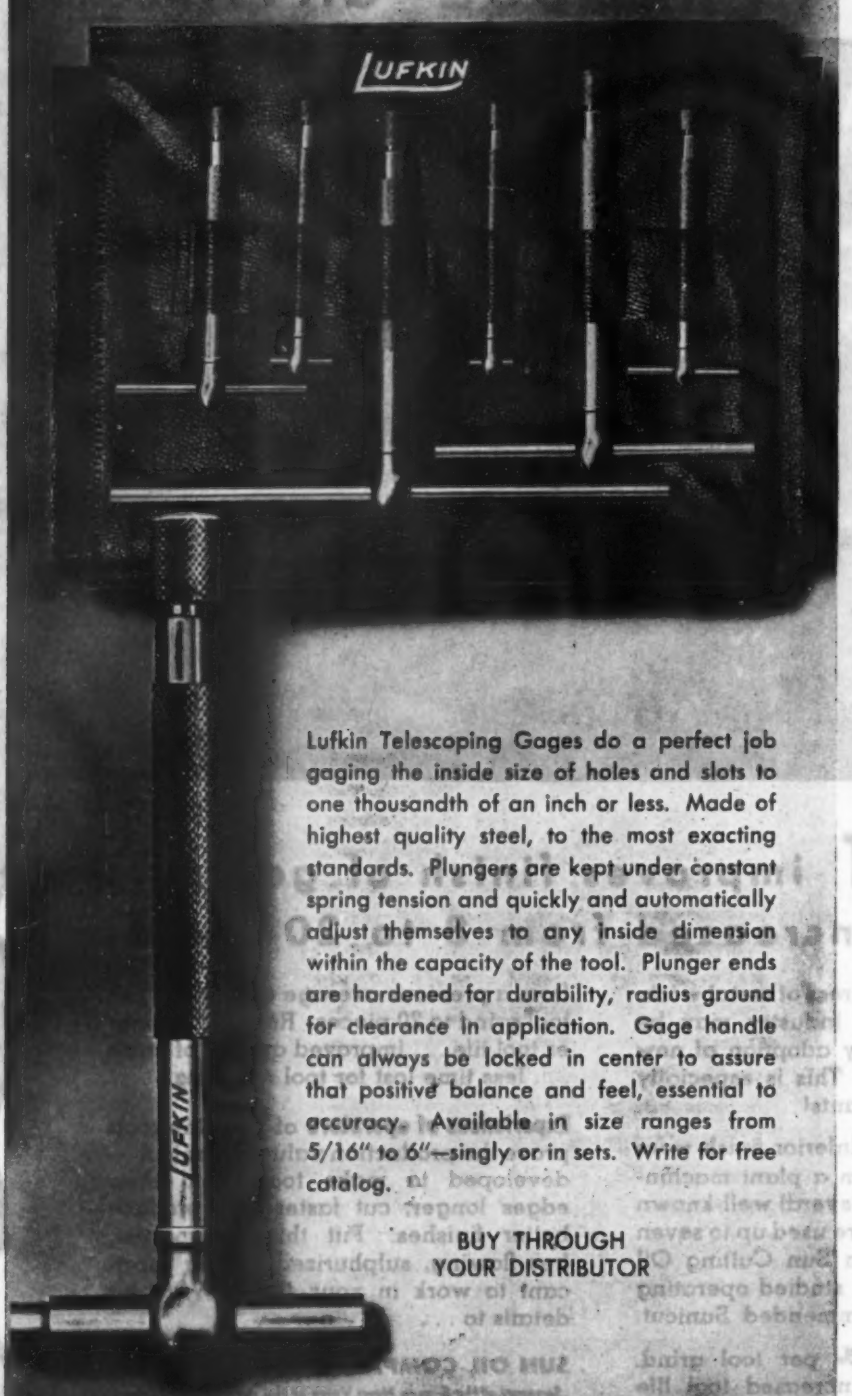

Lufkin Telescoping Gages do a perfect job gaging the inside size of holes and slots to one thousandth of an inch or less. Made of highest quality steel, to the most exacting standards. Plungers are kept under constant spring tension and quickly and automatically adjust themselves to any inside dimension within the capacity of the tool. Plunger ends are hardened for durability, radius ground for clearance in application. Gage handle can always be locked in center to assure that positive balance and feel, essential to accuracy. Available in size ranges from 5/16" to 6"—singly or in sets. Write for free catalog.

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8, Ore., or 1800 N. Adams St., Peoria 1, Ill.

Trucks—Specifications of "Transporter" electric-propelled industrial truck. ATC Bulletin No. 1001. Automatic Transportation Co., 101 W. 87th St., Chicago 20, Ill.

Varnishes—Booklet describes properties of DC 993 varnish with procedures for applying silicone insulation to electrical equipment. Dow Corning Corp., P.O. Box 592, Midland, Mich.

X-Ray Equipment—Booklet describes Penetrameters, and bulletin No. 2544 shows types of inspection cabinets giving dimensions and description of equipment. Picker X-Ray Corp., 300 4th Ave., New York 10, N. Y.

NEW BOOKS

SILVER BAY PROCEEDINGS—*Report of the 27th annual industrial conference held in 1944. Single copies of the proceedings (160 pages) are available from Earl M. Dinger, 347 Madison Ave., New York 17, N. Y., for $1; in lots of ten or more at 75 cents each.*

Each summer leading managers from industry, personnel executives, labor leaders and government representatives gather at Lake George, N. Y., for a conference on management problems. Theme of the 1944 meeting was: "For Early Victory: Better Industrial Relations." Qualified speakers discussed topics such as: labor's postwar wants, management's rights, refitting veterans to industrial jobs, line and staff organization, seniority problems arising from demobilization, why foremen unionize, how to select and develop foremen, and personnel counseling.

•

AIR COMPRESSORS—*By Eugene W. Feller, operating engineer; former chief operator, Safe Harbor Water Power Corp.; Associate Editor of Power. 460 pages. Published by the McGraw-Hill Book Co., 330 West 42 St., New York 18, N. Y. $4.50.*

Drawing on his 23 years of power plant experience, the author presents practical information for operating and maintaining air compressors and supplying compressed air for industrial use. Various types of compressors are described and illustrated.

Installation, operation and main-

2.5 HORSEPOWER PER POUND

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VICKERS AIRCRAFT HYDRAULIC MOTOR

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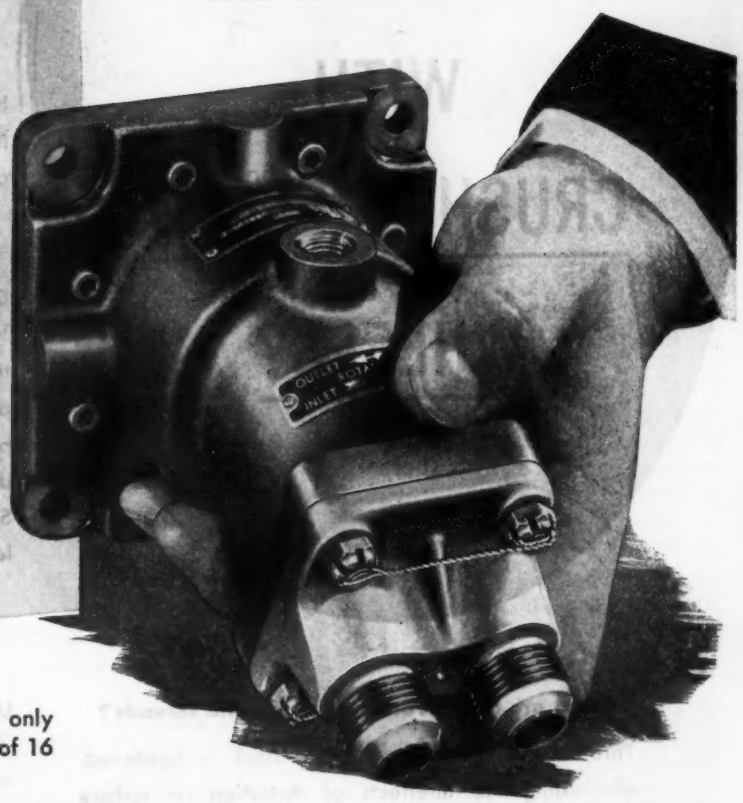

This Vickers Aircraft Hydraulic Motor weighs only 6.4 pounds yet it has a normal output rating of 16 horsepower at 3000 psi and 3750 rpm.

But a high horsepower/weight ratio is not the only advantage of using Vickers Hydraulic Motors for delivering rotary mechanical motion on many aircraft applications. These hydraulic motors save space as well as weight. Starting and stalled torque can be higher than operating torque if desired. They can be stopped accurately to position . . . no clutches or brakes are required. They are used for dynamic braking and can be stalled for long periods without damage. These hydraulic motors can be started and stopped at high acceleration and deceleration rates due to the very low inertia of the moving parts. They cause no radio interference. Reversal and accurate control of speed are very simply and easily accomplished.

Whether designed primarily for aircraft work or for flexible power transmission and control in industrial installations, Vickers Piston Type Hydraulic Motors are inherently simple and rugged, with resulting minimum maintenance; they are easy to install and widely adaptable. All of these characteristics suggest many applications to a wide variety of new postwar equipment.

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WHAT IS PLUNGE GRINDING OF THREADS WITH CRUSH DRESSED WHEELS?

What are the advantages of ground threads?

Threads can be ground after stock is hardened, eliminating the ill-effects of distortion or surface decarburization from heat treating—especially desirable in the case of tubes and other thin-walled components. Critical thread elements are accurately produced and held concentric with other ground diameters and threaded sections.

How can threads be ground most quickly?

By plunge grinding with a crush dressed multi-ribbed wheel on the Precision Thread and Form Grinder made by the Sheffield Corporation, Dayton 1, Ohio.

What is plunge grinding of threads?

It is the production of a full threaded section equal to the width of a crush dressed multi-ribbed wheel in one quick operation of less than two revolutions of the work.

To what can plunge grinding be compared?

It takes much less time than required with thread hobbing, is far more accurate, and tooling costs are considerably lower.

Is thread plunge grinding fast?

Definitely yes! The wheel is fed into full depth in ⅓ to ½ revolution of the work, and only one additional revolution is required to complete the threaded part. Sections of threads up to 1¼" in length can be quickly produced by plunge grinding on the standard Sheffield Precision Thread and Form Grinder. Special capacity machines are available for other lengths and sizes.

Does plunge grinding produce threads to an accuracy of class 3 fit?

Unusual uniformity of thread angle, lead and pitch diameter is commercially possible with the Sheffield Precision Thread and Form Grinder especially designed for plunge grinding. Thick first and last threads are eliminated in plunge grinding. On this machine, plunge grinding produces commercial work to not less than a Class 3 Fit accuracy in all cases—and to Class 4 Fit in many.

How can more information be obtained on plunge grinding?

By writing to the Sheffield Corporation, Dayton 1, Ohio.

THE SHEFFIELD CORPORATION • DAYTON 1, OHIO

tenance information is presented in detail, with special emphasis on engineering practices that generally are known only to those working in the three separate branches. Various reciprocating compressors and their components are described along with lubrication measures and over-all economy.

Compressor operation, accessories and the range of maintenance steps are presented. Rotary, centrifugal and axial-flow compressors are discussed at length. One complete chapter is devoted to the theory of compressing air, and deals with important fundamentals, behavior of mixtures and other factors involved.

Since industry is becoming more air-minded, this book offers an avenue of becoming familiar with all types of compressors and their operation for consideration in making purchases.

SEEN and HEARD

By JOHN R. GODFREY

Growth of Grinding

WITH THE USE of Vitralloy and other hard materials to resist wear and high temperatures, the improvements in grinding practices are of great assistance to manufacturers. While in some instances carbide-tipped cutters can be used to advantage, in others it is cheaper to grind special forms from the solid, as in the case of taps and other tools.

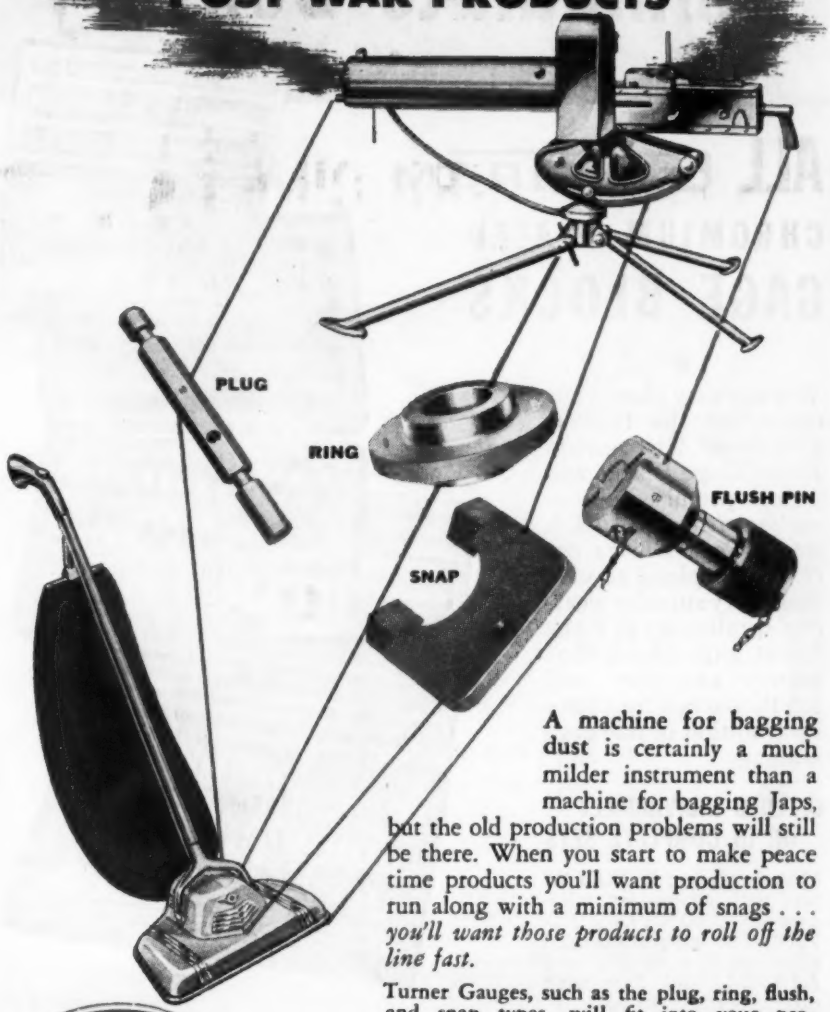
Here is one of the places where the new method of forming grinding wheels by the crushing process is of great assistance. Instead of shaping the wheel face with a daimond, a hardened roll of the proper contour is forced into the face of the grinding wheel, forming it to the desired shape in a short time and with unbelievable accuracy. One recent case is in the forming of serrations by which a rapidly revolving blade is held in a steel hub. The same method has been used to grind wheels for forming Whitworth threads having round tops and bottoms, together with the proper angle.

Phonographs to Helicopters

YEARS AGO I saw Emile Berliner make one of his early disk records on a zinc plate. He coated it with wax, had a man sing into the machine, etched the plate in acid and played the record to us. This was the beginning of the flat record that replaced the Edison cylinder for entertainment purposes.

In looking over some early developments of radial airplane engines, I find that this same Emile Berliner bought two of the Adams-Farwell engines from the Adams Company, in Dubuque, Iowa, in 1907. And he wanted to use them in some helicopter experiments.

HOW TURNER GAUGES CAN BE USED ON YOUR POST WAR PRODUCTS



A machine for bagging dust is certainly a much milder instrument than a machine for bagging Japs, but the old production problems will still be there. When you start to make peace time products you'll want production to run along with a minimum of snags . . . *you'll want those products to roll off the line fast.*

Turner Gauges, such as the plug, ring, flush, and snap types, will fit into your production picture to help you produce a better product in less time.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2875 MILTON ROAD • • FERNDALE 20 MICHIGAN

The men who make TURNER *gauges*

We believe that the development of the individual and the expansion of our company are *mutually dependent realities.* That is why the men at Turner experience individual freedom and initiative, which in itself, seems to encourage a real desire for cooperation among all employees.

Immediate Delivery

ALL ELLSTROM CHROMIUM PLATED GAGE BLOCKS

★

You can now place your order for the famous Ellstrom Chromium Plated Gage Blocks and we can promise you *immediate delivery. All Ellstrom Gage Blocks are chromium plated* to give them very superior wearing qualities. It's the finest gage block that money can buy and solidly backed by a family tradition of fine gage making.

OFFERED INDIVIDUALLY OR IN COMPLETE SETS

in three classes: *WORKING* Sets with guaranteed tolerance of ±.000008"; *INSPECTION* Sets with guaranteed tolerance of ±.000004" and *LABORATORY* Sets with guaranteed tolerance of ±.000002".

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

LIKE A FLAWLESS DIAMOND finely cut to bring out all its brilliance and quality, each Ellstrom Chromium Plated Gage Block is made of the finest steel and finished by expert workmen to accuracies up to ±.000002 of an inch.

★

Incidentally, this Adams-Farwell engine, which was designed for and used in a rear-drive automobile in 1898, antedated the Growe and Le Rhone, rotating cylinder engines used in World War I. It was illustrated in the AMERICAN MACHINIST and other periodicals of that time. It was designed to be made into engines having up to 18 cylinders, in a double row, but five-and six-cylinder engines were probably the only ones built. It was a two-cycle injection-type engine, with two spark plugs per cylinder. I have photos to prove it!

Too Much "Perfection"

BY FRANK C. HUDSON

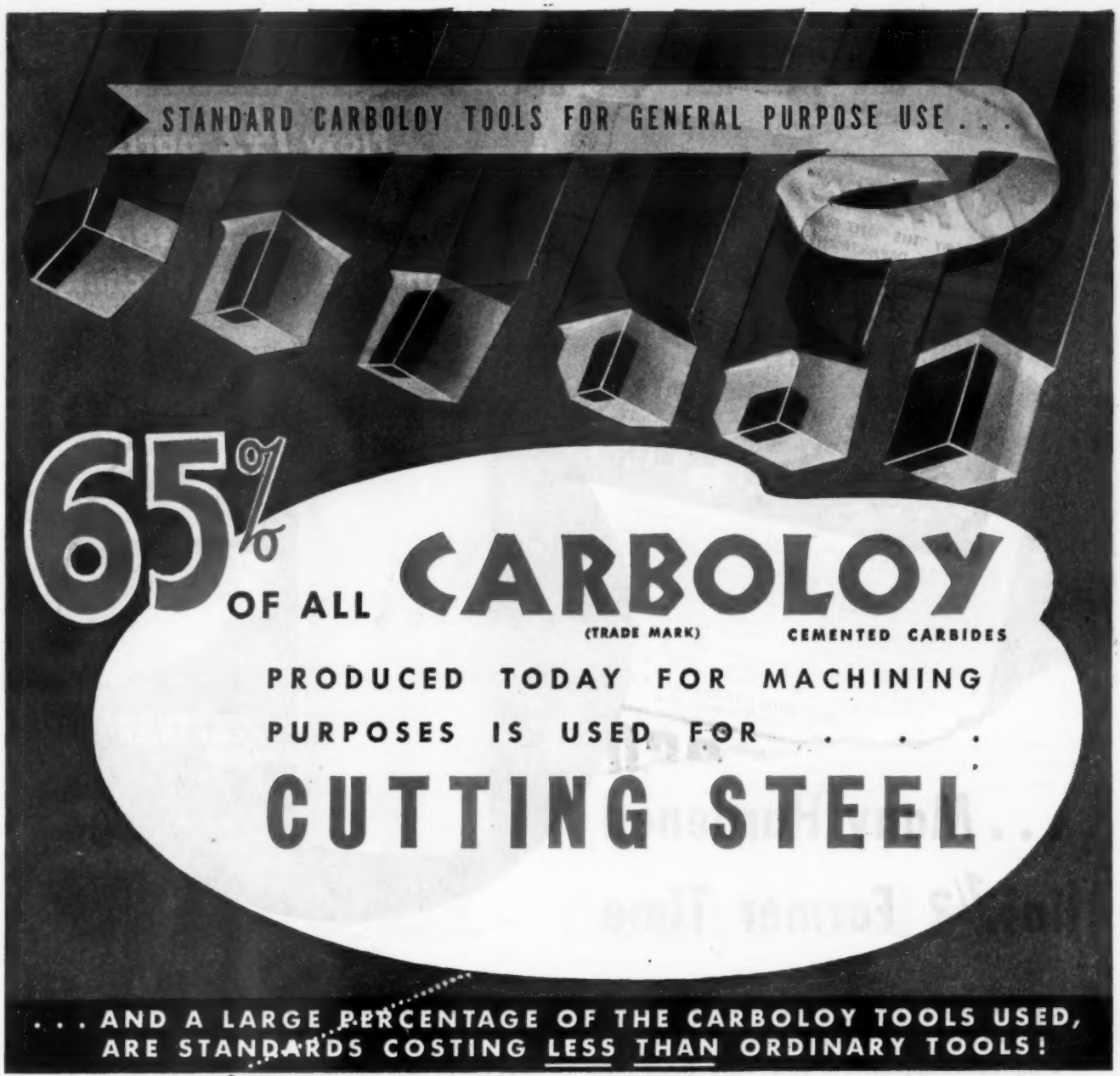
THOSE WHO RECALL the time it took for this nation to get into production on many kinds of munitions in this global war probably think that industry learned its lesson and that there's nothing more to worry about on that score. Actually, however, there is still a desire for too much "perfection." It is generally accepted that often it takes too much time to get into production on new and highly desirable military items merely because every effort is made to surpass similar items made by the enemy.

In World War I, German airplane engines were criticized because they were heavier than American-built engines. But the fact remains that German engines were turned out faster because specifications did not demand that the last ounce of weight be removed. Furthermore, the engines could be kept in service much longer between overhauls.

In this war, some captured items of Nazi and Japanese production are far less complicated in design than comparable American designs. The enemy equipment is inferior, but lends itself to rapid production, and much of it has been used effectively against the United Nations' forces.

No one can quarrel with the fact that American soldiers and sailors should be equipped with the best possible military items. But if simpler designs will put effective weapons in their hands sooner by months, then such a course is well worth consideration.

Many instances of production delays can be traced to a failure to submit designs to production engineers before they are frozen into "musts." When "getting there fastest with the mostest" may shorten the war by months, designs that can be put into production at the earliest possible moment and that can be made at the fastest rate are of vital importance.


STANDARD CARBOLOY TOOLS FOR GENERAL PURPOSE USE . . .
65% OF ALL CARBOLOY (TRADE MARK) CEMENTED CARBIDES
PRODUCED TODAY FOR MACHINING
PURPOSES IS USED FOR . . .
CUTTING STEEL
. . . AND A LARGE PERCENTAGE OF THE CARBOLOY TOOLS USED,
ARE STANDARDS COSTING LESS THAN ORDINARY TOOLS!

Tops in economy—tops in performance—on steel cutting! That's why, today, 65% of all Carboloy Cemented Carbides, produced by Carboloy Company, are grades for cutting steel.

Designed to cover the entire range of steel cutting—from heavy interrupted cuts, such as on tough cast armor plate, to high speed precision finishing of aircraft forgings—Carboloy Tools for steel cutting, stay on the job for long, continuous periods of operation, hold close tolerances, and produce an unusually high quality of finish.

Best of all, when you specify Carboloy "STANDARD" Tools, these results are available to you at an initial tool cost often *less than* that of *ordinary* tools. *Many Carboloy "Standards" are actually priced lower than "ordinary" tools.* Write for catalog GT-175R.

CARBOLOY CEMENTED CARBIDES

CARBOLOY COMPANY INC., 11147 E. 8 Mile Street, Detroit 32, Michigan

CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE • NEWARK • PHILADELPHIA • PITTSBURGH • THOMASTON

79 PARTS
HARDENED BY THIS "ONE MAN HEAT-TREATING DEPARTMENT"
THE COOPER-BESSEMER CORP., renowned builder of top-quality engines and compressors for vital war and peacetime equipment, is discovering how to reap the fullest extent. Its progressive Hardening to the benefits of TOCCO Induction engineers have scheduled 158 different parts for this versatile "one-man heat-treating department"; are already TOCCO-hardening 79 parts, 75 of which are pictured above. Highlights of these operations: are pictured above. Highlights of these operations:
Sizes of parts vary from ½ oz. set screws to 186-lb. cross-head pins.
Materials include SAE 52100, SAE 4615, SAE 1112, SAE 1045, NE 8620 and Meehanite Metals.
Typical time savings: Formerly hardened 100 large wrist pins in 13.5 hrs.; harden 100 in 3.5 hrs.—savi
Push-rod buttons formerly 15 seconds. They're now
valves and other parts
Typical production
hardens 1800 pieces
ent set-ups.
Other benefits:
eliminates straigh
chining. The
affords favorable
Our experienc
in which TOCC
THE OHIO CRANKSHAFT CO
Cleveland, Ohio
Now 142 parts TOCCO-HARDENED by Cooper-Bessemer on one Tocco Machine
186-LB. CROSS-HEAD PIN...
...½-OZ. SET SCREW
...BOTH HARDENED BY SAME TOCCO MACHINE.

...Many Hardened in 1/3 Former Time

THE above report on the TOCCO hardening of 79 parts for Cooper-Bessemer engines and compressors appeared in July, 1943. Since then, the production of 63 more parts has been assigned to this versatile "one-man heat-treating department."

These 142 parts range in size from ½ oz. set screws to 186-lb. cross-head pins. Materials include SAE 52100, SAE 1050 modified, NE 8620, Meehanite, as well as carburized low-carbon, carbon and alloy steels. All are hardened on the same TOCCO machine.

TOCCO cuts the hardening time of many of these parts 75%; eliminates straightening; reduces machining and grinding; provides better working conditions.

Find out how versatile, speedy TOCCO Induction Heating can improve *your* products, step up *your* output and cut *your* costs. The 32-page book, "Results with TOCCO," free on request.

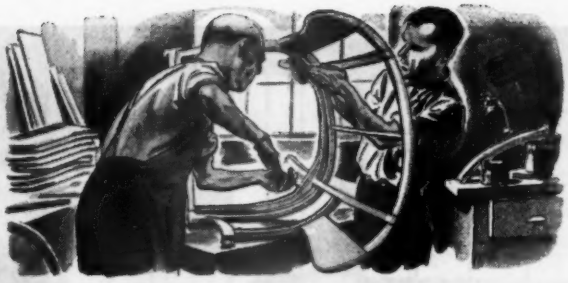
THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio

TOCCO

INDUCTION

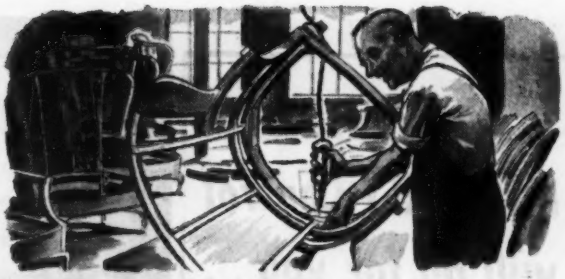
HARDENING, BRAZING

ANNEALING, HEATING



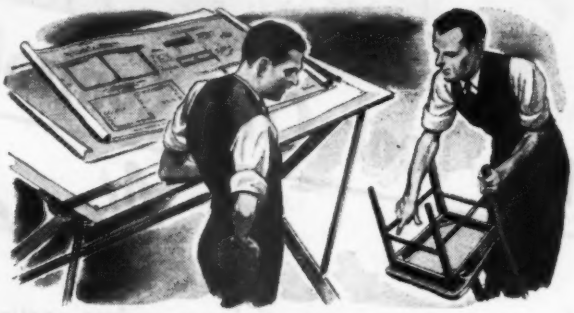
BACKLOG BREAKERS!

Finding it impossible to keep pace with orders as long as he used slotted screws, one leading furniture maker broke up his assembly jams once and for all by switching to faster-driving Phillips Recessed Head Screws.



MONEY MAKERS!

This switch cut assembly time almost in half. It cut 10% off pre-assembly by making pilot holes unnecessary. On top of this it saved 33-1/3% in labor costs because Phillips Screws drive so much faster!



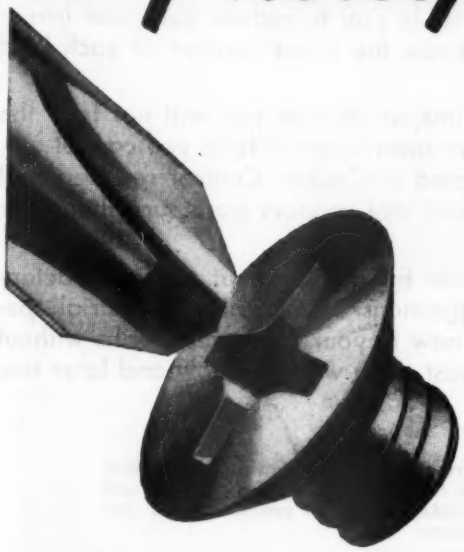
PRECEDENT SHAKERS!

Pace-setters in production and cost-reduction activities, Phillips Screws are helping designers shake things up, too. Much more strength and rigidity can be built into products than was ever possible with slotted screws.

ORDER TAKERS!

And when it comes to buy appeal, other screws just aren't in it with Phillips Screws. Salesmen say they banish burrs that endanger both clothes and sales . . . and make *any* product look stronger, smarter, trimmer!

It's Phillips . . . the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

What McCASKEY Control will do for you . .

Experiences in hundreds of plants, large and small, employing from a few to many thousands, prove that McCaskey Tool Crib Control . . .

1 Reduces crib inventories

2 Eliminates loss and theft of tools

3 Reduces breakage to an absolute minimum

4 Quickly locates all tools whether in the crib or in possession of workmen

5 Speeds crib service, reducing non-productive waiting time of workers and machines

6 Reduces tool clearance time of departing employees to a fraction of a minute

7 Definitely records employees' responsibility for tools, preventing disputes when tools are returned or workers quit

8 Is operated with minimum crib personnel; inexperienced attendants of either sex trained in about one shift

9 Is easily installed in busiest cribs and plants; initial investment and operating expense quickly repaid.

10 Provides for inspection and, when necessary, reconditioning of used tools before replaced in bins

11 Shows how long workmen retain tools; prevents keeping more than necessary at any time

12 Provides perpetual inventory and record of tool activity for elimination of obsolete tools and reduction of excessive inventories

13 Gives you facts justifying or denying necessity for tool purchases

14 Provides reliable data on life and comparative performance of brands and types of tools

15 Gives you accurate basis for allocation of tool expense to various departments

Why Install Tool Crib Control Now?

The pressure for production on essential war orders continues. Dependable men are scarce. Why add the job of installing a new tool crib system now?

There are fifteen reasons in the column at the left. Consider only two.

Tools have been scarce, as everyone knows. As a direct result, most tool crib inventories are unbalanced. Purchasing pressure has caused over-stocks of many items; others still are dangerously low.

McCaskey Tool Control provides a simple means of determining actual requirements. It will enable you to reduce your tool inventory with assurance that you know the exact number of each kind and size you need.

When you resume peace-time production you will not face the necessity of sacrificing excessive inventories of tools you cannot use. One plant that recently adopted McCaskey Control reduced tool purchases to such an extent that tool vendors were sure their contracts had been "cut back."

Installations are being made by girls without previous factory experience, aided by the suggestions of McCaskey industrial specialists. The job can be done now in your most active cribs without disturbing production in the least. You will save now and later too.

●

Let us have a representative explain how McCaskey Tool Control will pay for itself in a day or two under present conditions—or send you factual reports on McCaskey savings in productive time and tools in several well-known plants.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Remember these

FREE-MACHINING MONELS

as your source of STRONG, TOUGH, RUST-PROOF screw stock

"R" MONEL

...for parts not to be hardened by heat treatment

Here's a specially developed grade of Monel you can use in making parts on high-speed automatic screw machines. Aside from its free-cutting characteristics, "R" MONEL provides practically the same mechanical properties and corrosion resistance that have made *regular* Monel so valuable. Its strength is equal to that of the best steel screw stock.

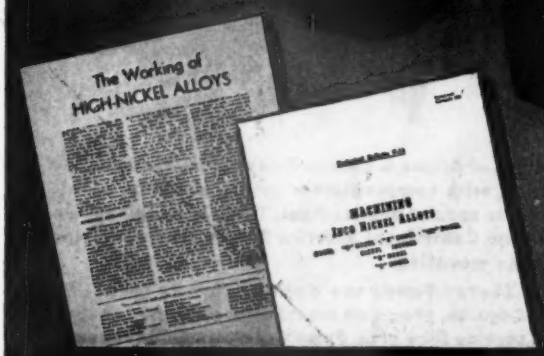
COLD-DRAWN OR HOT-ROLLED
ROUNDS • SQUARES • HEXAGONS

"KR" MONEL

...for parts to be hardened by heat treatment

"K" Monel has long been known for its great strength and hardness. Now you have its *machinable* brother, "KR" MONEL, to use for screw machine parts where a heat-hardenable material is needed to withstand heavy loads. "KR" is your best bet for corrosion resisting parts that must be made extra hard and strong through heat treatment.

FREE-MACHINING "R" AND "KR" MONELS
CAN SAVE YOU TIME AND MONEY!



MACHINING TECHNIQUES for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, *"The Working of High-Nickel Alloys."*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Gentlemen: Please send me

☐ a copy of Machining Bulletin T-12
☐ a copy of "The Working of High-Nickel Alloys"

Name.....

Duties.....*Title*.....

A.M. 4-45

Company.....

Address.....

CM

Here's a hand operated hoist with

12 BEARINGS!

CYCLONE

Faster action, higher operating efficiency, lasting endurance, easier handling—that's what you get in the aptly named High Speed CYCLONE Hoist. You can depend on this "tops in performance," because only in the CM Cyclone will you find **12** anti-friction bearings—a ball or roller bearing at *every* rotating point. Other extra value features are: Extra safety from the smooth gyrating yoke action... internal guides to prevent load chain slippage... accurate meshing of machine cut gears... shielded lift wheel... CM "Inswell" electric weld load chain. For a hand operated chain hoist here, definitely, is outstanding value.

Capacities from ¼ ton up.
CM Bulletin No. 100 contains complete details. Write for it.

CHISHOLM-MOORE
HOIST CORPORATION
(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y.

SALES OFFICES: New York, Chicago, Cleveland, San Francisco, Los Angeles.

Available from Stock

= 0-80 and = 1-72
SCREWS and NUTS
Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
WALTHAM, MASS.

COOLANT, LUBRICATION, HYDRAULIC POWER—
You Get all 3 with this Unit

The designs of Brown & Sharpe Pumps many times adopt the pumps, with comparatively simple additions or alterations, to special applications. The triplex unit shown includes one Centrifugal and two Rotary Geared Pumps with flange mounting.

Brown & Sharpe Pumps are distinguished by their simplicity of design, precision manufacture and by the long, reliable service they give. Pump Catalog sent on request.

Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

GEARED - VANE - CENTRIFUGAL - MOTOR DRIVEN

BROWN & SHARPE PUMPS

BACK IN '38...
As long ago as 1938, to help conserve tungsten, Latrobe pioneered in the development of a tungsten molybdenum type high speed steel, known as DOUBLE SIX.
6-6

TODAY...

LATROBE DOUBLE-SIX ...meets M-2 specifications

Long before Hitler and his hordes over-ran the Low Countries, the war in China had cut off the supply of essential tungsten. That was back in '38, and Latrobe, realizing the urgent need for saving available tungsten, through painstaking research developed a new high speed steel, known as DOUBLE SIX.

Today, with only minor changes in its original analysis, DOUBLE SIX M-2 meets the automotive industry's specifications for molybdenum-tungsten high speed steels. Born of war-time necessity, Latrobe's DOUBLE SIX M-2 is assured a permanent place in the field of high speed steels, not only for the war emergency but for the peace-time needs to come.

Write for our latest bulletin on Double Six M-2

S-2

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES and PLANT •• LATROBE • PENNSYLVANIA

HIGH SPEED STEELS · DIE STEELS · TOOL STEELS · STAINLESS · LATROBE RED ARROW for metal-cutting tools

SCHATZ "Commercial" BALL BEARINGS

SCHATZ "Commercial" Ball Bearings meet the demand for GOOD ball bearings at low cost.

BALL bearings mean low friction, less wear, fewer opportunities for trouble.

SCHATZ "Commercial" Ball Bearings are strong, rugged, accurate. Designed and manufactured to give long and satisfactory service under all circumstances.

THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
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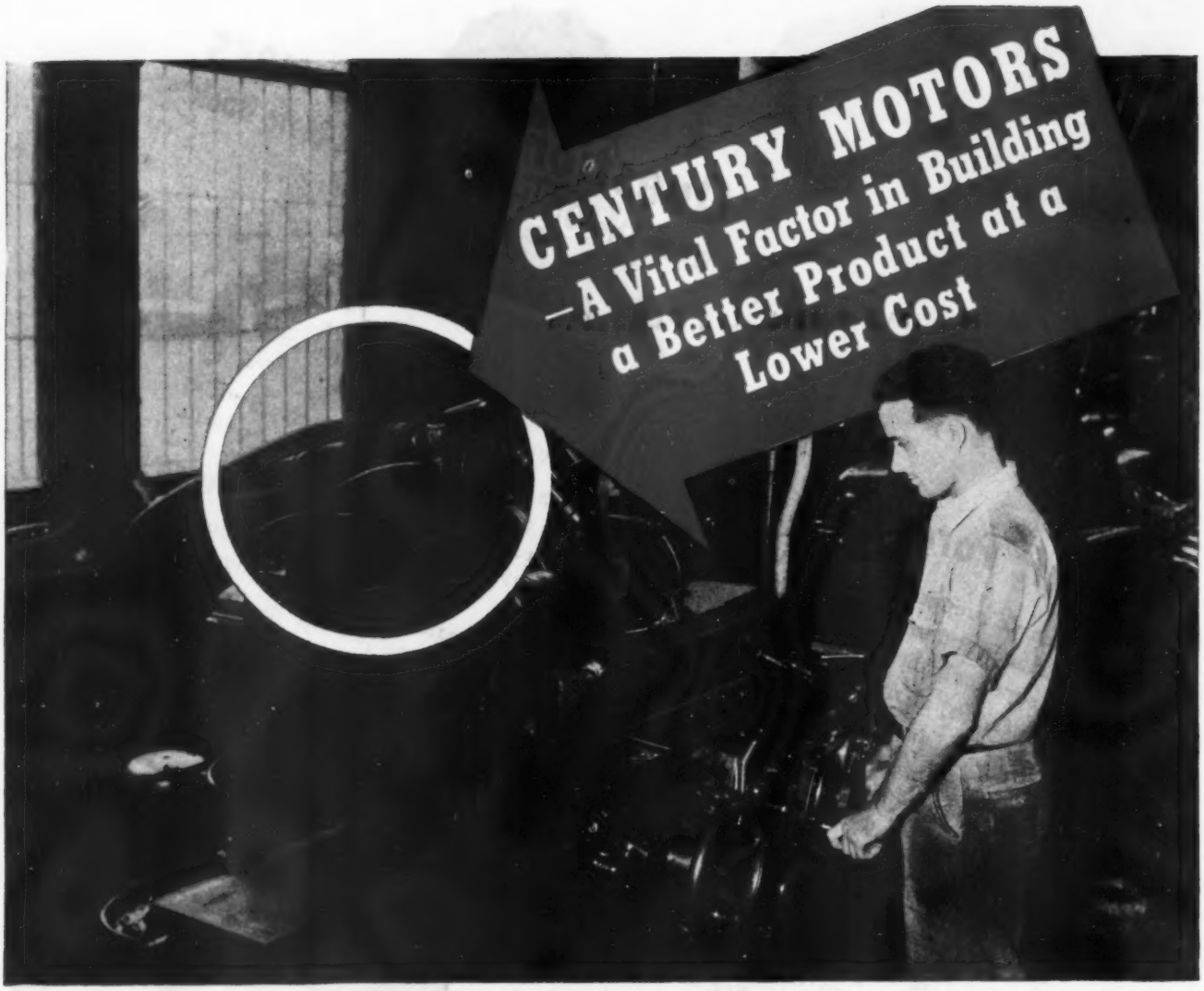
Questions and Answers
from The Old Hammerman's Note Book
Aircraft Forgings . . .
1 Are tensile strength, endurance limit, wear resistance and impact strength and ductility superior in directions (a) parallel to flow lines? (b) at right angles to flow lines? (c) at any angle to flow lines?
2 By what process is it possible to direct metal flow lines to obtain increased tensile and impact strength, toughness, wear resistance and endurance limit? (a) by casting? (b) by forging in closed impression dies? (c) by stamping?
3 Why is it important for aircraft design engineers to thoroughly understand the fibre-like flow line structure of steel?
4 (a) How are designers taking advantage of the inherent value of forgings? 4(b). Why?
5 How are you preparing for Forging Sales post-war?
ANSWERS
1 (a) Parallel to flow lines.
2 (b) By Forging in closed impression dies.
3 So that they may design parts to utilize fully all the values inherent in directionally worked fibre structure or flow lines for safety of aircraft.
4 By specifying forgings wherever possible in view of weight in the finished aircraft. 4(b). Because airmen have faith in the greater factor of safety in forgings.
5 Perhaps we can help you in your post-war planning.
ARMY
NAVY
ERIE
ERIE FOUNDRY COMPANY, ERIE, PA.
ERIE BUILDS Dependable HAMMERS



Century 7½ horsepower squirrel cage, totally enclosed, fan cooled motor driving a grinder.

One of the vital factors in building better products at lower cost is the accuracy and dependability of the production machines —the lathes, grinders, drill presses, milling machines, boring machines, etc. There is where Century Motors aid in solving Industry's No. 1 Problem.

Century Motors' unusual freedom from vibration contributes to the accuracy of the machines they drive, resulting in higher quality of parts produced, fewer rejects, and greater production at lower cost.

Century Motors are today proving, and will continue to prove the sound value of such design features as—accurate machining and balance, rugged frames, extreme rigidity, accurately machined feet, end bumpers of unique design, and many others.

If you have a problem involving any electric motor application, call in a Century engineer.

Century Motors are built in a wide variety of sizes and types from 1/6 to 600 horsepower.

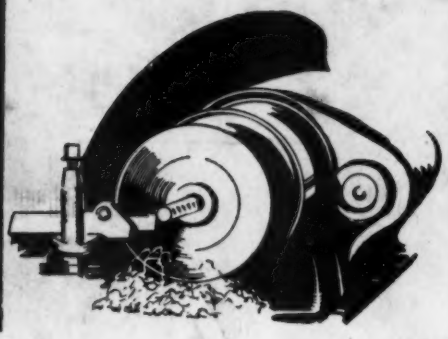
421

CENTURY ELECTRIC COMPANY • 1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

MACHINING DATA ON PLASTICS

4. MACHINING PHENOLIC PLASTICS



This is the fourth in the series of messages designed to better your knowledge about the machining of molded phenolics — the most versatile of all plastics... the type of plastics which Durez has specialized in producing during the past quarter century.

The machining of molded phenolic compounds is not recommended except in instances where it is impossible to mold the desired shape or form. This is because the machining of a phenolic destroys its lustrous surface to the extent that it cannot be reproduced except in the case of a few special materials. Even then, it involves considerable time in sanding the surface with fine emery cloth and also in buffing the machined surface.

Durez phenolic molding compounds are produced in different types and, consequently, various fillers must be used. Some of these fillers possess poor machining qualities in themselves due to their abrasive nature. Therefore, each type of material presents its own machining problem. The machining properties of various fillers can be classified in the following order: Wood flour—Good, Fabric—Fair, Cotton—Fair, Mineral—Poor.

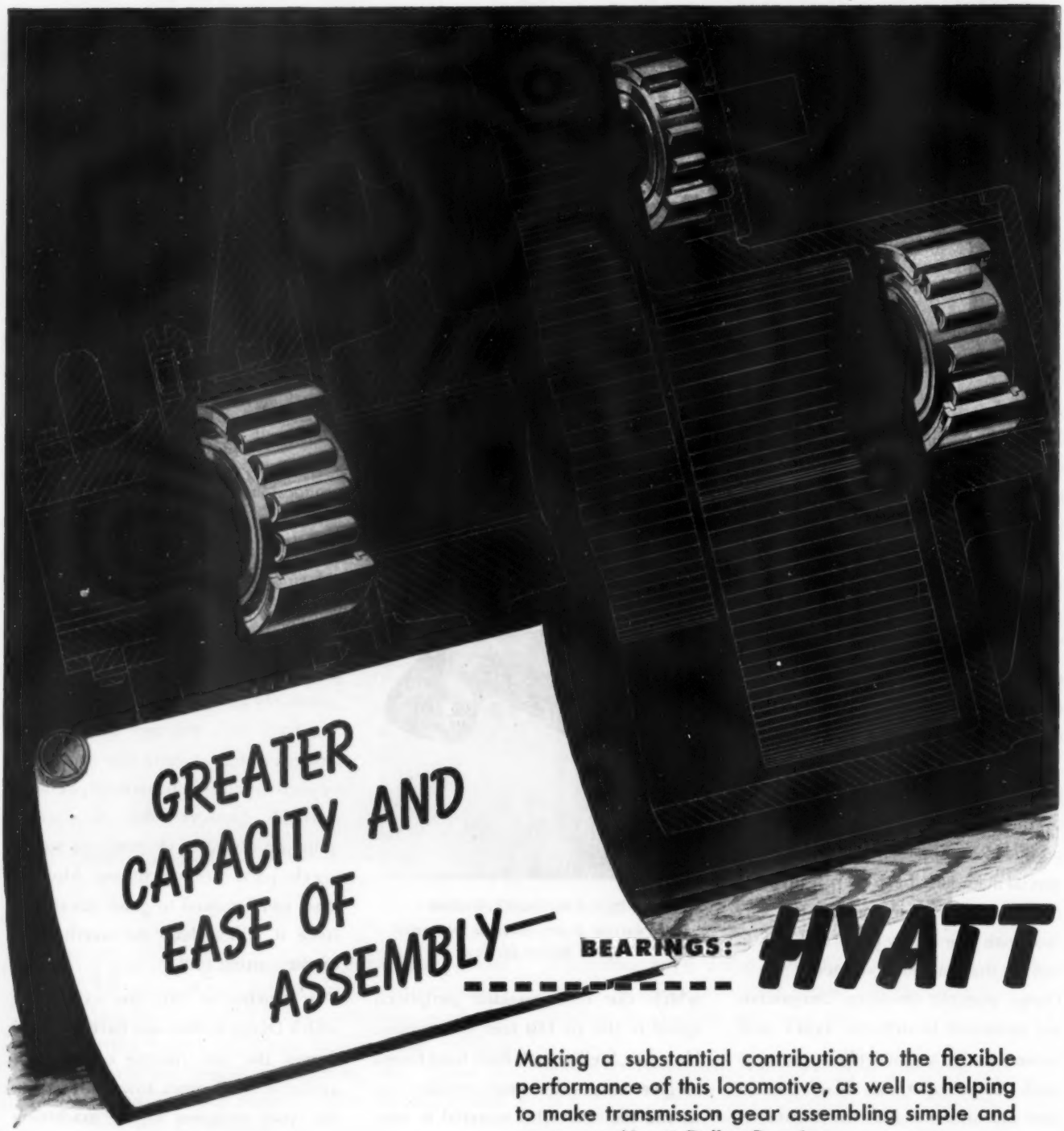
When small quantities are involved, high-speed steel tools can be used for which the recommended peripheral speed is 100 to 150 feet per minute. However, Stellite tools have been found to give more satisfactory results due to the fact that this material is very hard and wear-resistant—and is highly impervious to the heat generated while machining. The recommended peripheral speed for Stellite tools is 200 to 300 feet per minute. For large quantity production, it's suggested that tungsten-carbide-tipped tools be used for which the recommended peripheral speed is 300 to 600 feet per minute.

A typical machining operation is the narrow groove found on the receiver of the modern telephone

These recommended peripheral speeds can be applied to lathe turning tools as well as to milling cutters. Tools commonly used are given a slight negative back rake and approximately 8° clearance angle. Liquid lubricants can be used for machining molded phenolic materials. However, they do present quite a problem in cleaning and washing the parts after machining. Also, air blast can be used to good advantage since it will reduce the overheating of the cutting tool.

The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times towards furthering your progress in the machining of phenolic plastics. Durez Plastics & Chemicals, Inc., 534 Walck Road, North Tonawanda, N. Y.

PLASTICS THAT FIT THE JOB



GREATER CAPACITY AND EASE OF ASSEMBLY—

BEARINGS: HYATT

Making a substantial contribution to the flexible performance of this locomotive, as well as helping to make transmission gear assembling simple and easy, are Hyatt Roller Bearings.

The Hyatt Bearings in this application have the capacity and stamina to withstand the strains and jolts of frequent starts and stops. They also provide the distinct engineering advantage of inner race seats that remain as fixed parts of the shaft which are never disturbed by having to be removed.

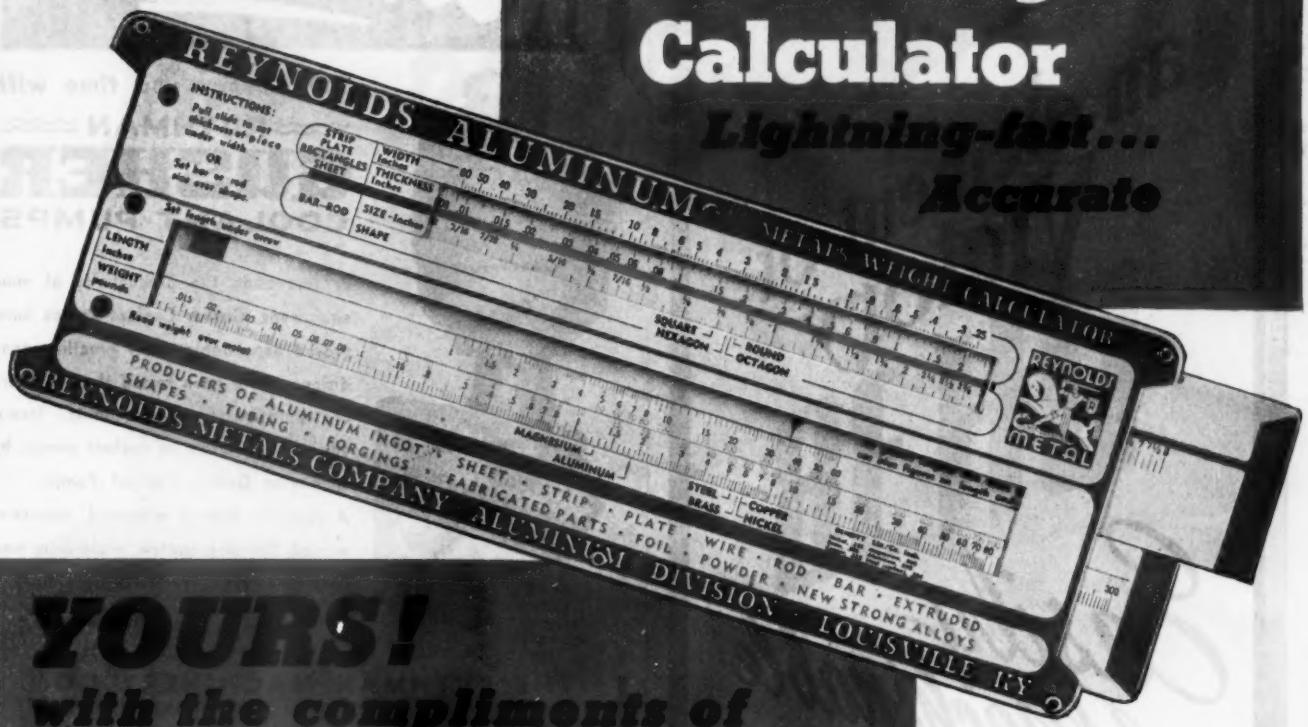
If your plans for any type of rolling stock or production machinery call for improved performance or machine simplification, Hyatt engineers will be very glad to help you solve the bearing problems involved.

The Plymouth DE 1000 Diesel Electric Locomotive is an achievement in high powered, highly responsive industrial locomotive design. Built by Plymouth Locomotive Works Division of The Fate-Root-Heath Company, Plymouth, Ohio.

HYATT BEARINGS DIVISION · GENERAL MOTORS CORPORATION
HARRISON, NEW JERSEY

NEW! Metals Weight Calculator

Lightning-fast... Accurate



YOURS!

with the compliments of

REYNOLDS ALUMINUM

Here is one of the handiest calculating devices ever developed.

All the answers INSTANTLY. Everyone who works with metals will find this instrument invaluable.

It does the work for you, saves up to 90% of the time and effort on weight calculation. Just make the settings—then read the results. Serves equally well with aluminum, steel, brass, copper, magnesium, and nickel.

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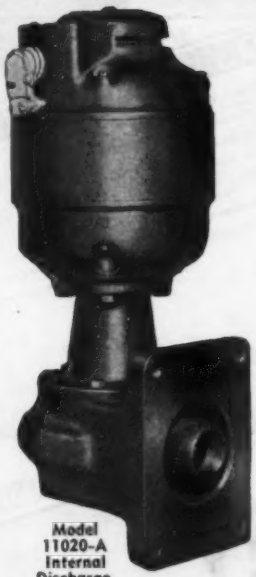

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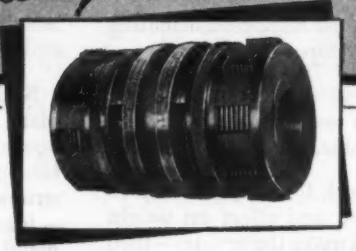

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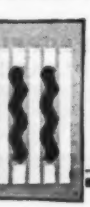

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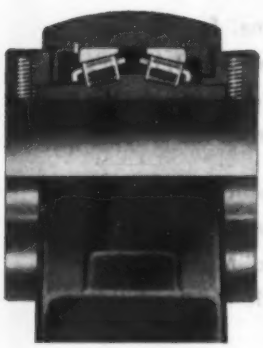

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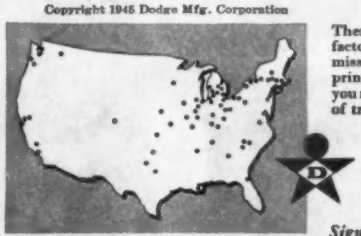

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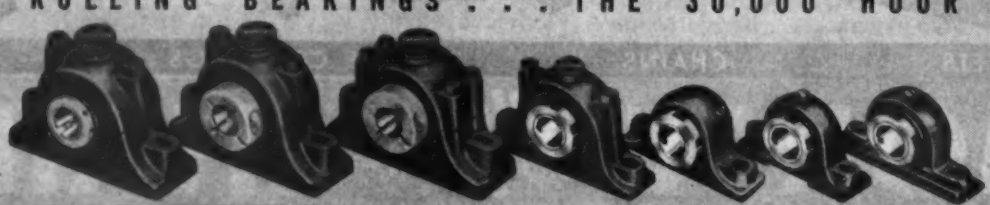

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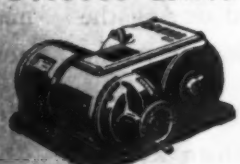

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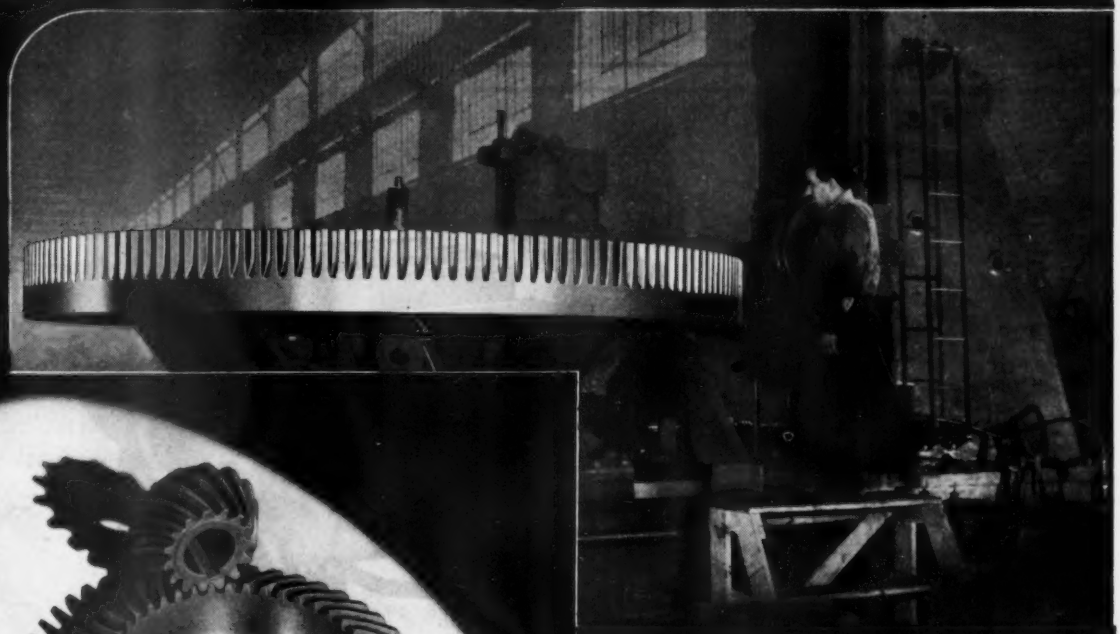

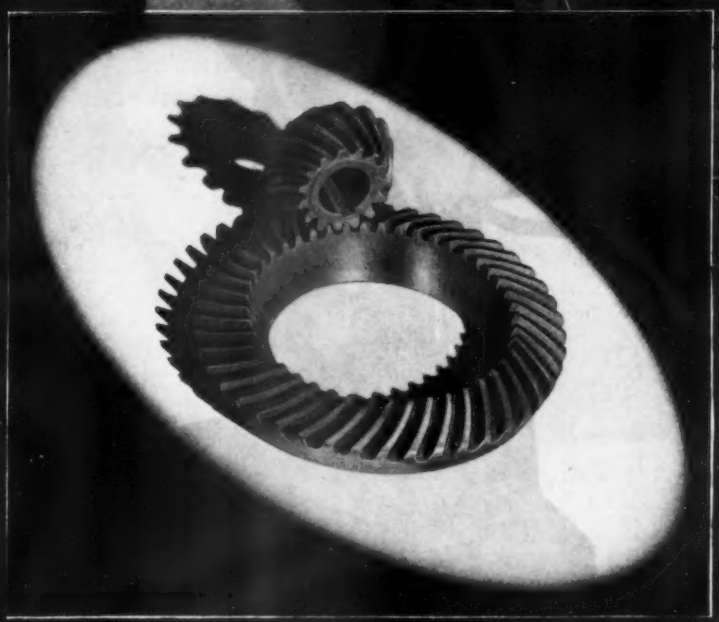

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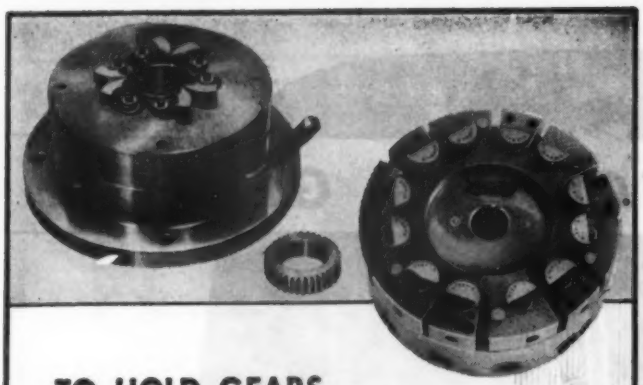

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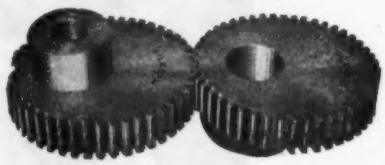

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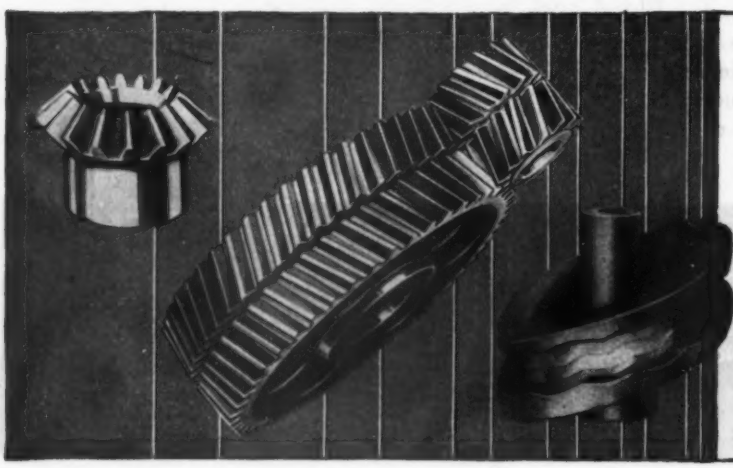

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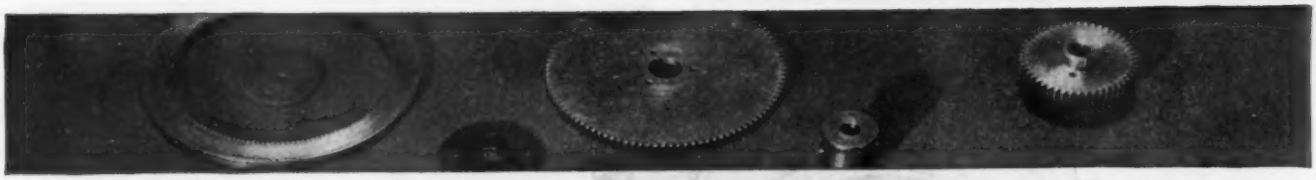

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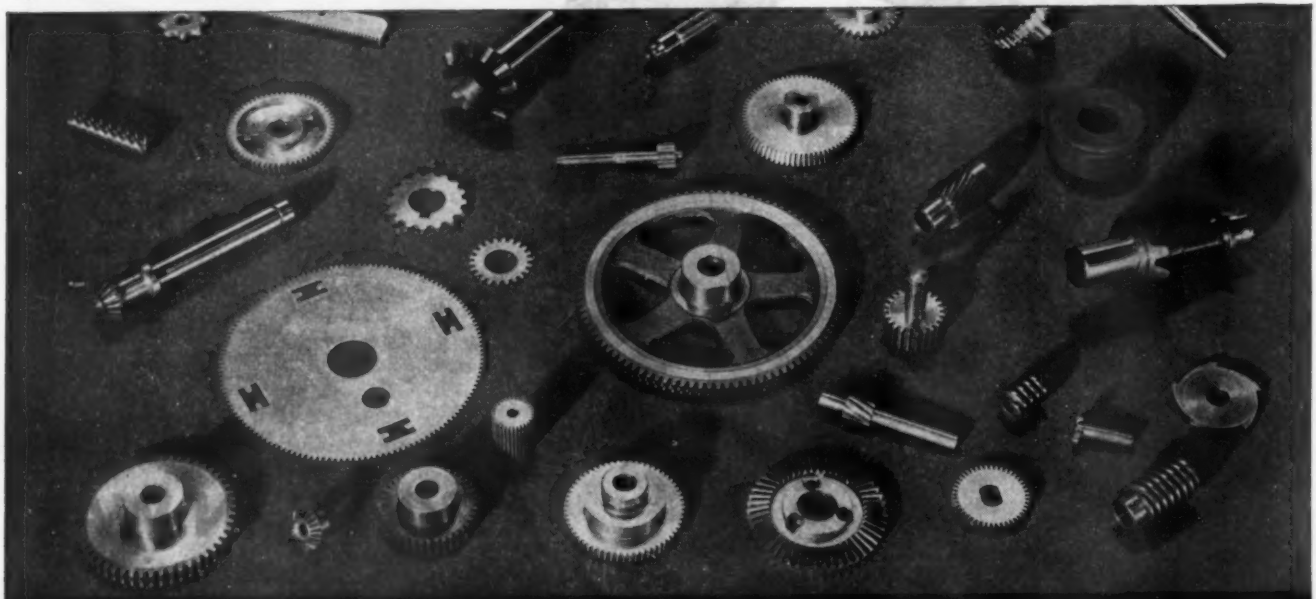

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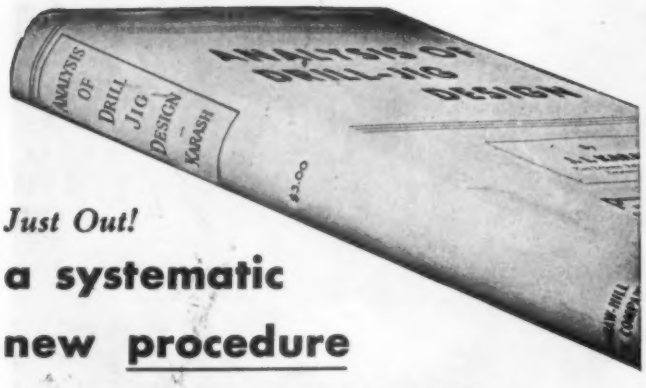

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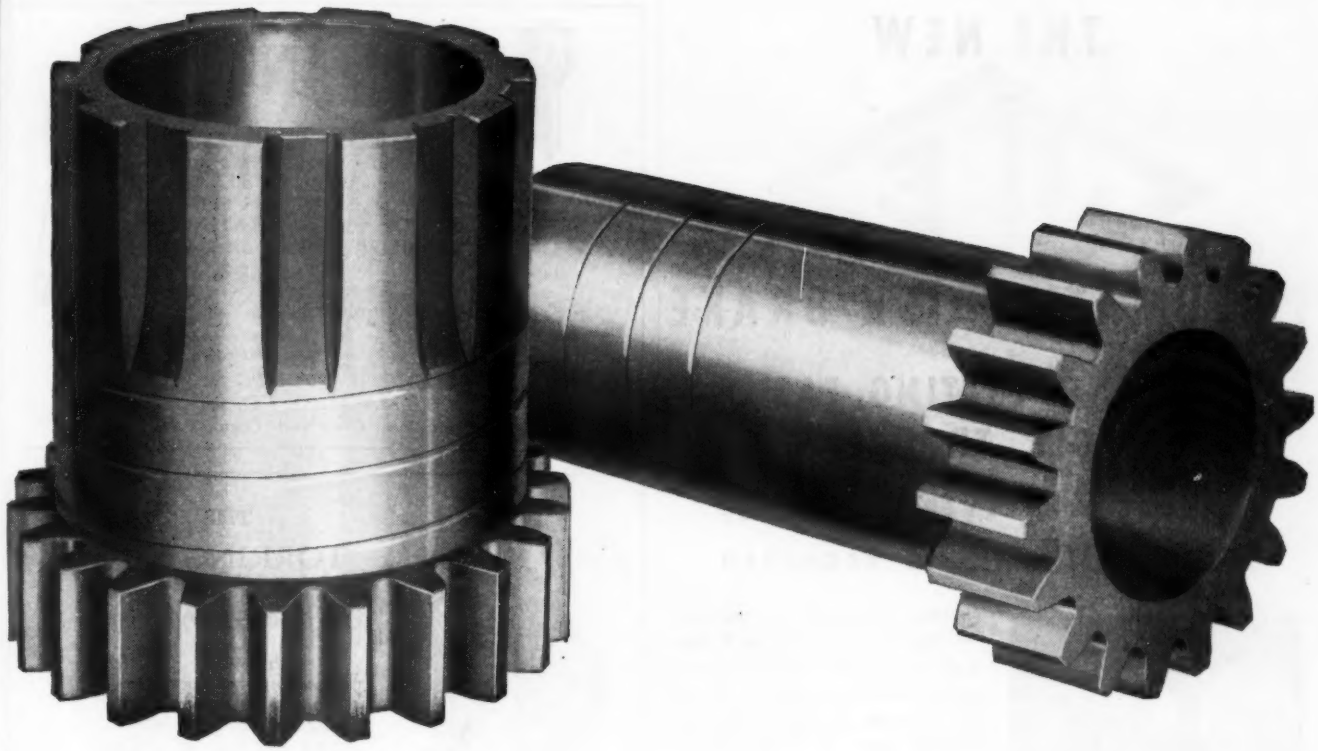

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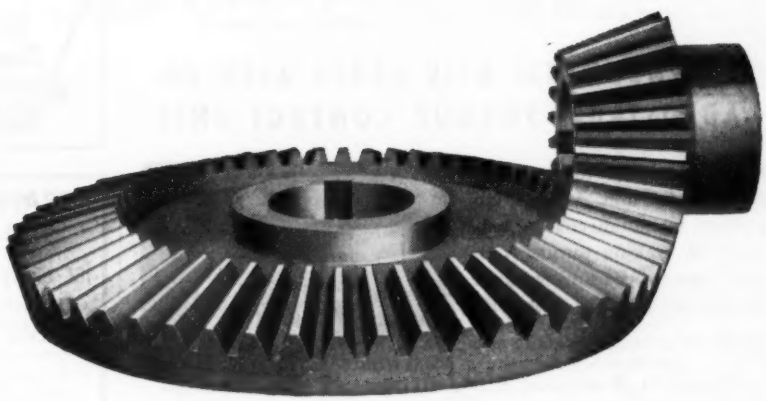

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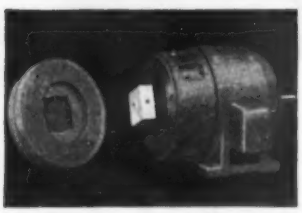
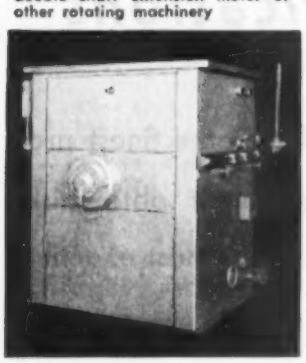
SMOOTH-OPERATING, EASILY ADJUSTABLE, TROUBLE-FREE

FOR USE WHEREVER **QUICK, SMOOTH-STOPPING** IS REQUIRED



JLE Pneumatic Disk Brake showing simplicity of mounting on any double shaft extension motor or other rotating machinery



JLE Pneumatic Disk Brake applied to main shaft of Automatic Reeling Unit

SIMPLY CONSTRUCTED, the new JLE Pneumatic Disk Brake is about one-half the size of comparable electrically operated disk brakes, yet has a braking torque four to eight times greater. No lubrication is required on the JLE Brake, maintenance costs are practically nil, and no adjustment is needed during the life of the friction disk. Easily mounted on a motor or rotating shaft extension, the JLE Brake *can be controlled from any electrical or mechanical stop motion device* and requires only 1/40 cu. ft. (or less) of free air per operation. The brake is made in single, double and triple disk sizes, with 100, 200 and 300 lb. ft. torques respectively. JLE Brakes will operate at pressures up to 125 lbs. p. s. i. for use on N. E. M. A. Brake Frame Motors and on any other rotating machinery.

JLE PNEUMATIC DISK BRAKE WITH JLE ADJUSTABLE TORQUE CONTROL UNIT

A compact, high-torque, low-cost control unit designed to permit instantaneous adjustment of braking torque from any remote position without change of brake adjustment.

Send for complete details and specifications to Church St., Pawtucket, R. I.

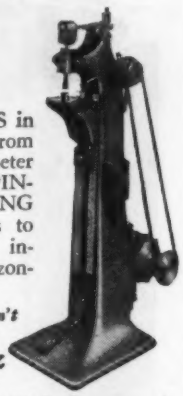
JLE Pneumatic Brake and Torque control unit

JAMES L. ENTWISTLE CO.
PAWTUCKET, RHODE ISLAND
World's Leading Manufacturer of Spark Testing Equipment

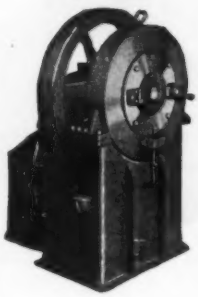
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
The V & O Press Company, Incorporated
HUDSON, NEW YORK

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

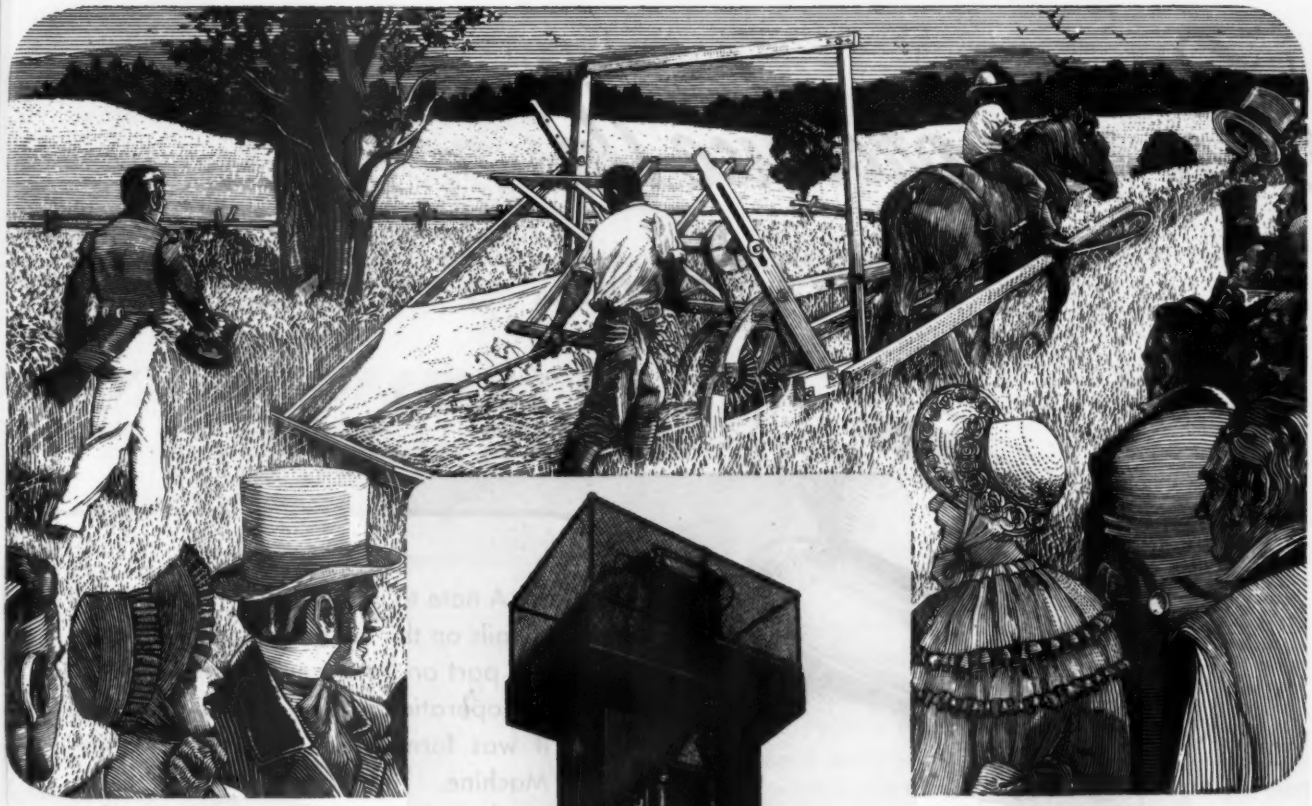
Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

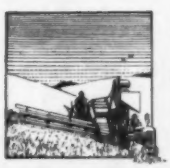
Full details on request.

straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.



46 ANCESTORS TOOK OFF THEIR HATS



On that bright July day in 1831 when Cyrus McCormick publicly operated his mechanical reaper so successfully, the ghosts of 46 previous machines stood rusting in American fields. For McCormick was not the first to build a reaper—the 46 prior patents, actually granted, attest to that. Many of those predecessors actually worked, after a fashion, but it remained for McCormick to make practical the long-sought idea of mechanical harvest.

Nor was Clearing the first to build a press for forming metal—yet Clearing Presses mark a revolutionary new era in press techniques and standards. Clearing made possible stampings to tolerances of undreamed of limits and of unprecedented size. Faster work cycles raised rates of production. These and other Clearing contributions put today's press operations far ahead of yesterday's.

If you are seeking lower costs or greater accuracy put your problem up to Clearing. We've already done many things that other folks said couldn't be done with presses, and it won't cost you anything to find out what we can do for you. Write to Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CMC CLEARING
MECHANICAL AND HYDRAULIC PRESSES
FOR SUCH OPERATIONS AS DRAWING • BLANKING • FORMING • FORGING

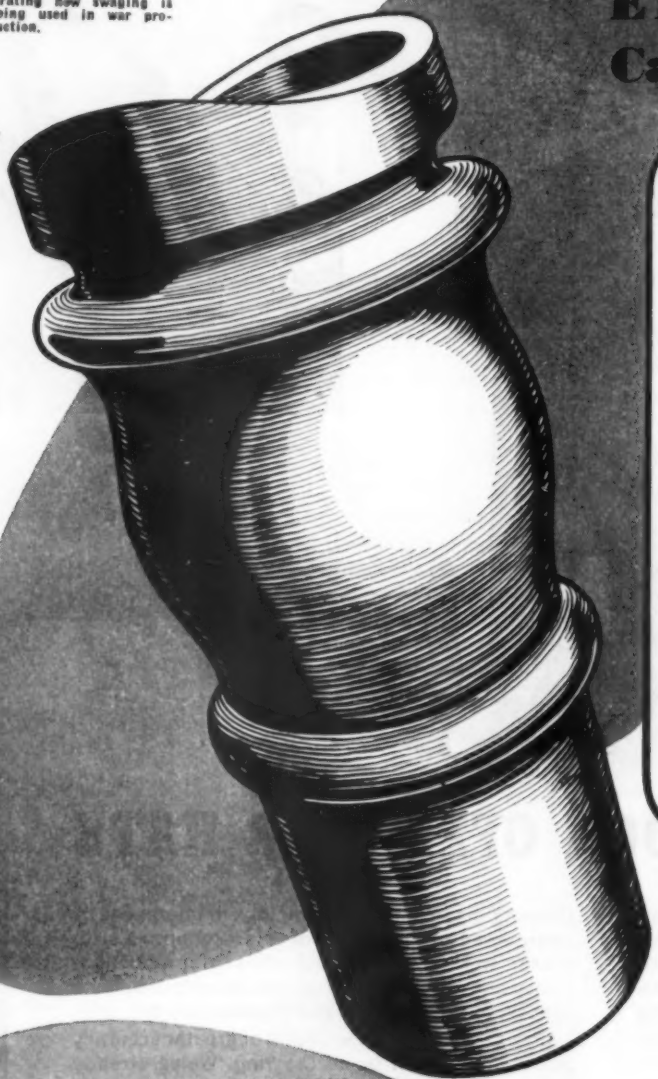
CLEARING ★

Can you produce this part...

WITHOUT MACHINING?

Third of a series demonstrating how swaging is being used in war production.

ETNA SWAGING UNITS Can...and do!



● A note to ETNA today will bring full details on the methods used to produce this part and the time loss and machining operations that were avoided when it was formed on an ETNA Swaging Machine. This is but one of the unnumbered tapering, sizing and reducing operations that can be handled easily, quickly, and with extreme accuracy on ETNA Swaging Machines—*without resorting to machining!*

Write for details . . . describe your tapering, sizing and reducing problems. We'll be glad to send a complete description of the advantages of Swaging as applied to your specific needs.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Co.

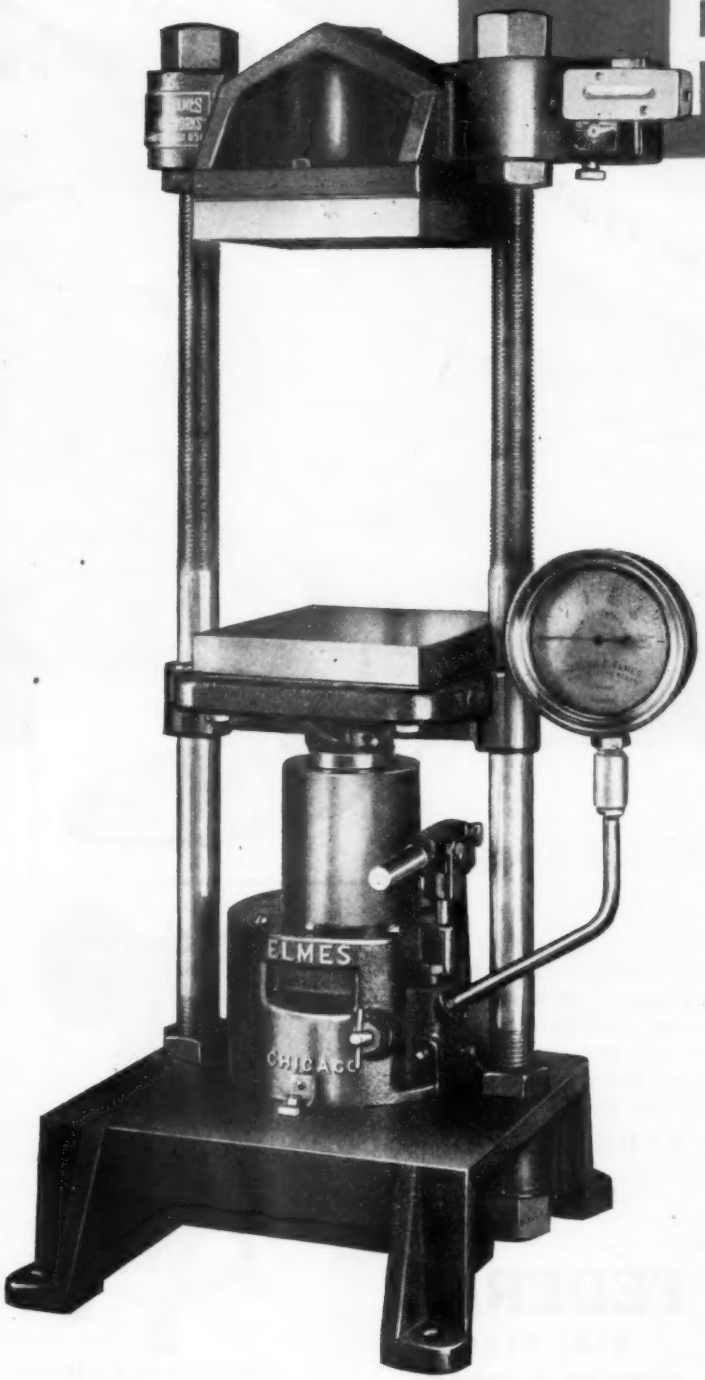
3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

ETNA Swaging Machines are built in diameter capacities from ⅜" to 8" die lengths and from 1" to 18", to handle tapering, sizing and reducing of hollow, solid, round or angular parts. Larger units are built to your specifications.

LABORATORY PRESSES

Built to Elmes Big-Press Standards of Performance



Small presses that are *built right* quickly pay for themselves in time and money saved.

In machine shops, tool rooms, and assembly and maintenance departments these *capable* little units are most welcome additions to plant facilities.

Inspectors use them for quick checks on purchased materials, for sampling tests on work in process, and for final inspection of finished products.

Industrial and commercial laboratories, universities, and colleges find these versatile small presses *indispensable* in development work on new products, new processes.

—and for short runs and small jobs of many kinds, a good laboratory press is itself an *ideal production machine.*

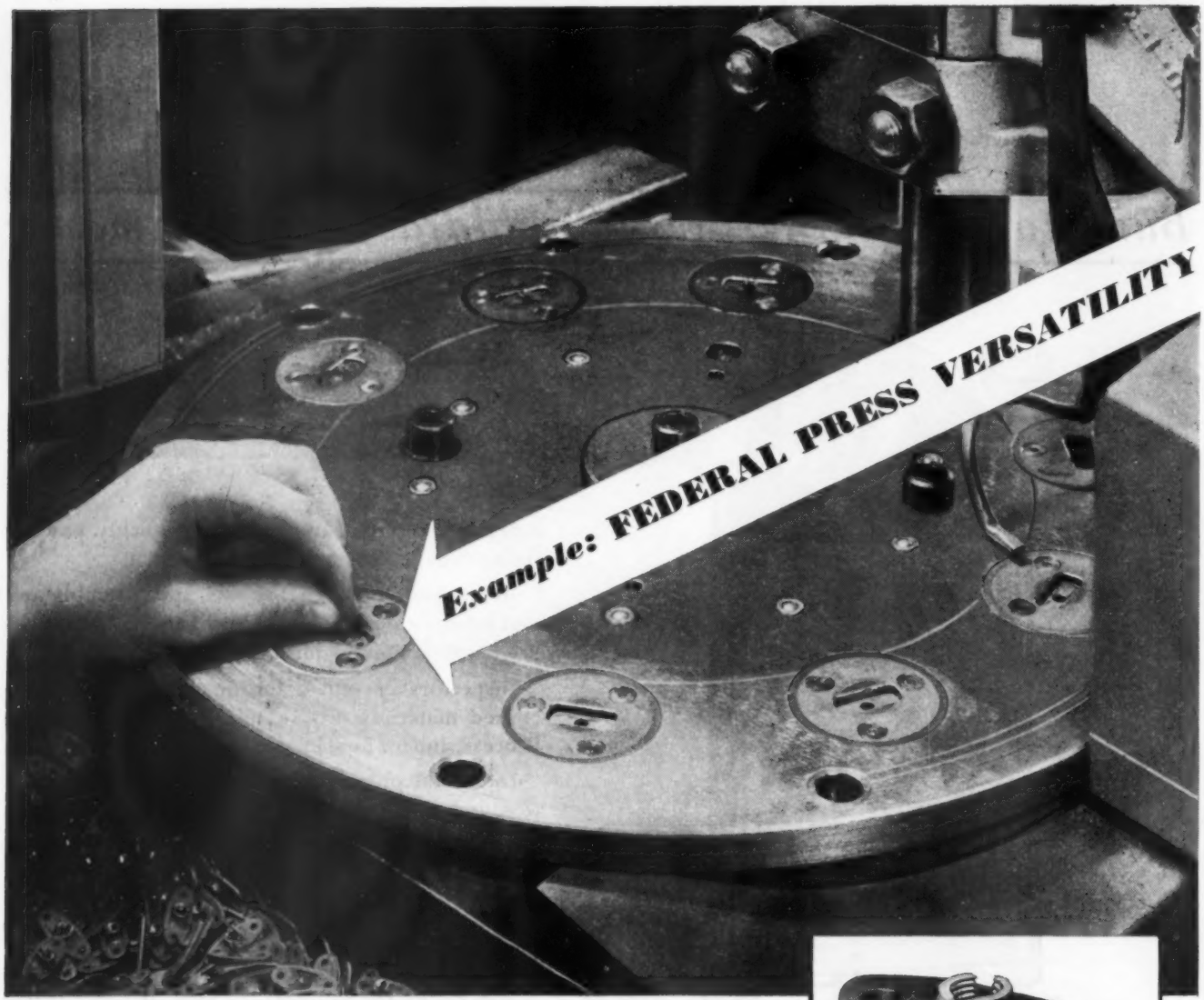
Ask us for Bulletin No. 1035A. It gives prices and complete specifications on 20, 30, and 50-ton models. All have Elmes precision-built hydraulic units with *honed* cylinder and wing-type *regrindable* valve.

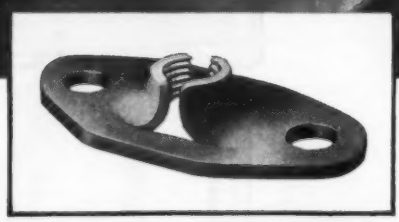
ELMES HYDRAULIC EQUIPMENT

Two-column, 20-ton Model No. 3429. Over-all dimensions: 17″ x 15″ x 41″ high. Opening: 0″ to 16″. Platen: 8″ x 8″ with full guides encircling both columns. Ram: 3″ diam., 6″ stroke. Weight: 425 lbs. Price, with gauge and lever extension, $168.00. Electric hot plates with "Off-On" switch, $40.00; with thermostatic control and temperature-setting indicator for 110-220 V., A.C., $55.00. Other accessories: See Bulletin No. 1035A.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 1001-1013 N. Fulton St., Chicago 7, Ill. • *Also Manufactured in Canada*

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES





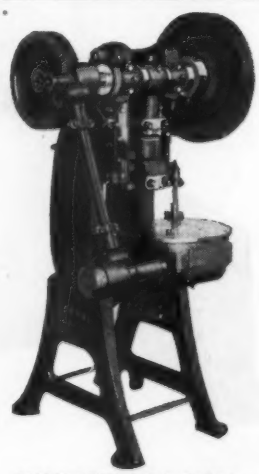
Torque-Setting "*Hi-Stress*" Speed Nuts

IN ORDER to operate efficiently and eliminate vibration loosening, the tapped prongs of these "Hi-Stress" Speed Nuts, manufactured by Tinnerman Products, Inc., must produce a specified amount of torque as bolts are inserted. This torque-setting is accomplished with a Federal Dial Feed Press—in one operation—at high speed! Says W. C. Kasper, Jr., "The Federal Press, with its cam-operated dial mechanism, gives us exactly the smooth feed we require".

Every day these versatile Federal Presses are solving more production problems—performing a wider variety of jobs which, until recently, were not thought of as press operations—saving time, work, and money. Very often they eliminate entirely the need for highly specialized machinery of limited utility. And production speed is frequently increased as much as 3 to 6 times. Write today for the Federal Press catalog which illustrates and describes the complete line.

THE FEDERAL PRESS CO.
1104 Division Street, Elkhart, Indiana
Telephone 2831

FEDERAL
DIAL FEED
PRESSES

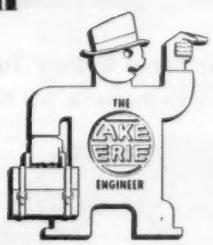


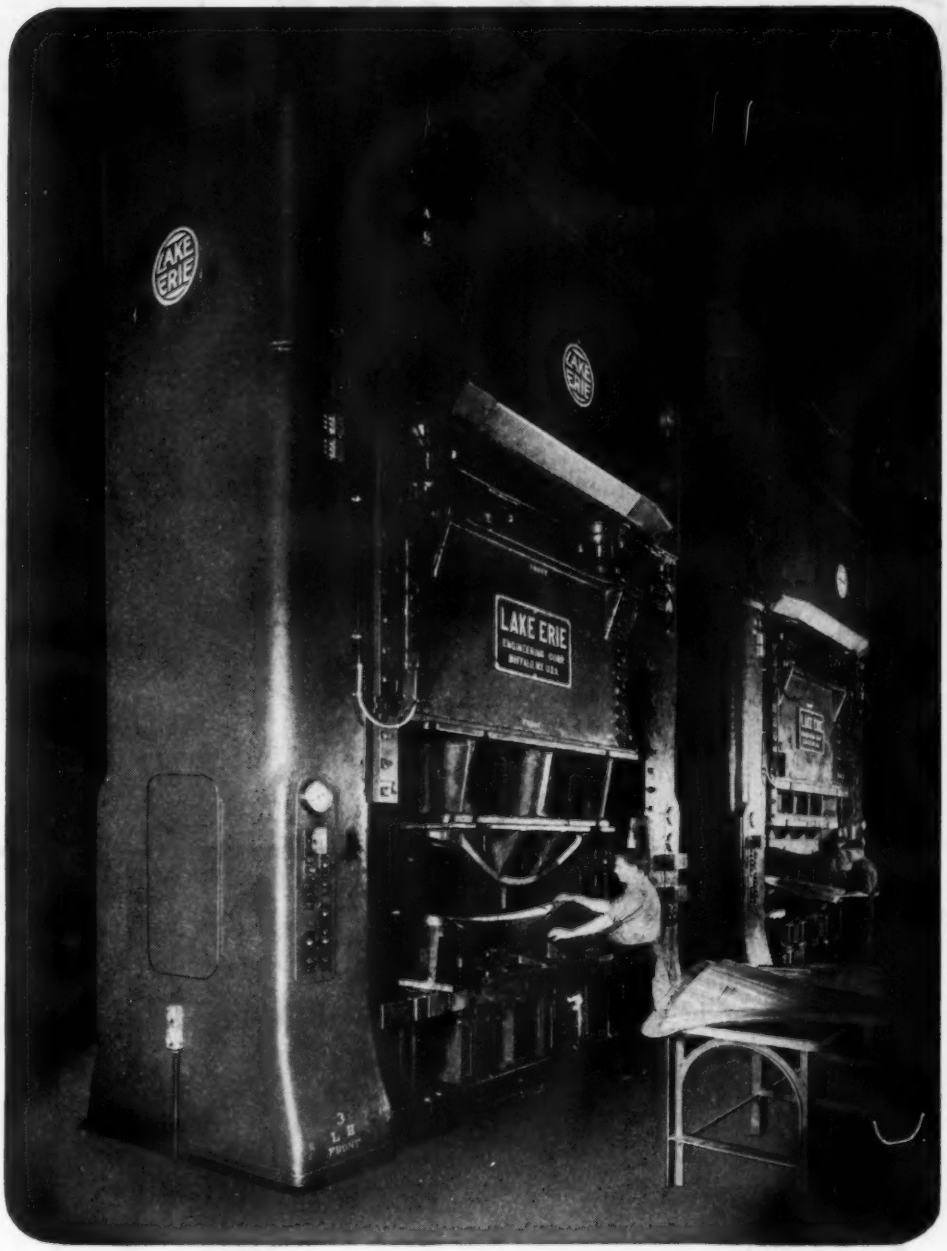
AVAILABLE IN 8 SIZES—CAPACITY, 6 TO 80 TONS

Order now—for war needs with priority—for early post-war delivery, without priority.

BOMBERS or BODIES

These Lake Erie Presses help to manufacture both





These 1000-ton Lake Erie double action presses with cushions and hydraulic stripper are two double slide housing type hydraulic presses built for the Ford Motor Company. They are now used in manufacturing bomber parts at Willow Run.

When they were being designed, Lake Erie engineers had the long range viewpoint that hydraulic presses would play an important part in economically producing the automobiles of the future.

When the time comes for reconversion, many industries will find the "power of the press" the answer that solves the fabricating problems which arise from the use of new metals and new designs.

Long experience in building hydraulic presses in a complete range of sizes and types gives our engineering staff and our supervisory and production forces the "know-how" to adapt standard presses to your needs or build special presses for your requirements.

The following bulletins will be sent on request:

144—Lake Erie Hydraulic Presses column type.

244—Lake Erie Hydraulic Presses side housing type.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

507 Woodward Ave., Buffalo 17, N. Y.
OFFICES IN PRINCIPAL CITIES

TAPPING TIPS

From Woody Spencer's Notebook

GIVE YOUR TAPS A CUSHION

After all, when you come to think of it, taps are *edged* tools, and keeping that edge in shape is one way to make sure of getting good work. I don't mean grinding—I mean protecting the edge when the tap is not in use. In one shop I know, the boys have found a smart way to protect taps. They use masking tape. Painters masking tape is soft but tough, doesn't tear easily and provides just the right "cushion" for tap threads. It's cheap, easy to get, easy to use. Wrapping taps in masking tape is a mighty fine way to cut down grinds and insure tap life. *Try it.*

These Tapping Tips are presented merely for their helpfulness in getting better work done, smoothing out routine jobs, lengthening tap life. They are not designed as technical advice on tapping problems.

For the tapping problems that come up with almost every operation, we suggest that you get specific engineering advice. Send us all details of the job (material, diameter, depth, lubricant, etc., etc.) and our engineers will give specific technical recommendations for those problems.

**Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.*

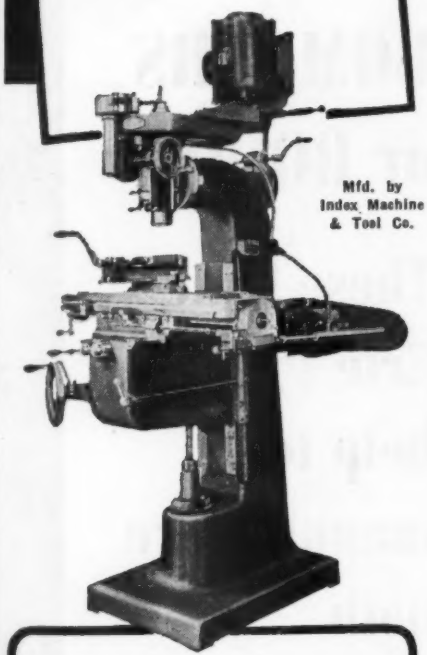
THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

12" Tool Room Rotary Table

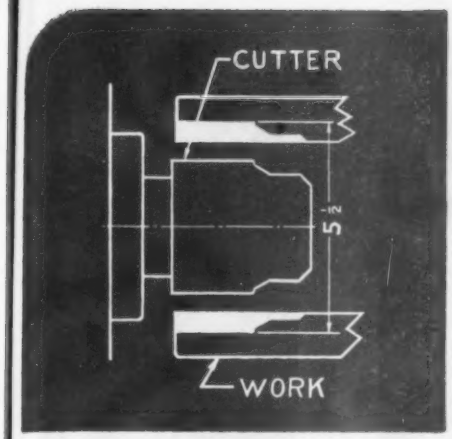
Mfd. by Index Machine & Tool Co.

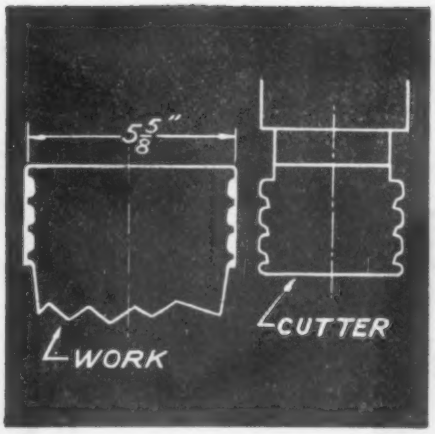
A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

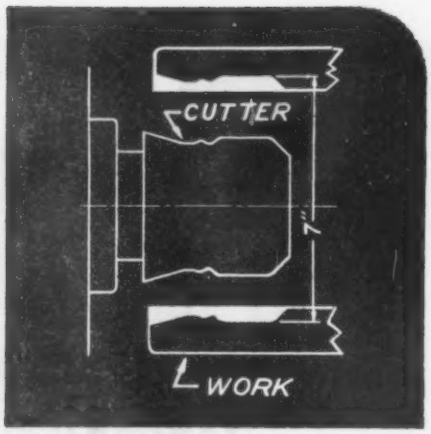
For use on Index Mills or any other machine that will accommodate a 12" table.

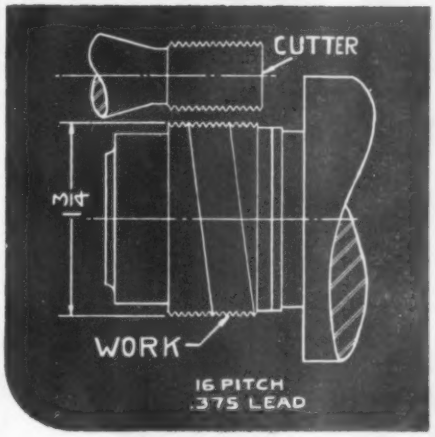
BLANK and BUXTON MACHINERY

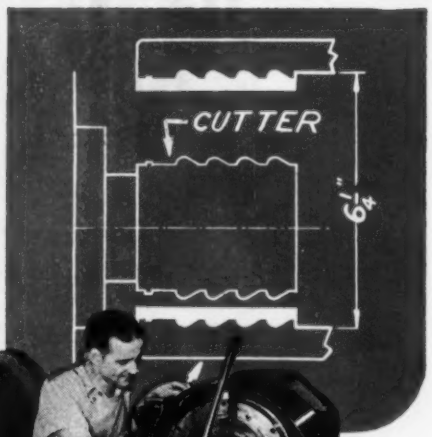
3100 E. MICHIGAN AVE.
JACKSON, MICH.











For Victory Today— Prosperity Tomorrow—

LOOK TO PLAN-O-MILL

For exceptional speed, accuracy and finish—at a saving of money, metal and manpower—look to Plan-O-Mill!

Plan-O-Mill provides a *better* method of form and thread milling. Plan-O-Mill offers outstanding rapid-production features, including General Electric's Thy-mo-trol for separate and complete control of feed-in and feed-around. Plan-O-Mill requires a minimum of skill to operate, a minimum of operator attention.

Shown above are typical examples of Plan-O-Mill production applications. If your war or post-war products involve internal or external threading or cylindrical forming, replace obsolete, wasteful machines with Plan-O-Mill. Contact your machinery dealer or write direct.

Firsts

PLAN-O-MI

FIRST to install General Electric's remarkable new Thy-mo-trol—electronic feed control!

FIRST planetary to mill external threads with standard multiple thread cutter!

FIRST planetary to coordinate feeds and speeds!

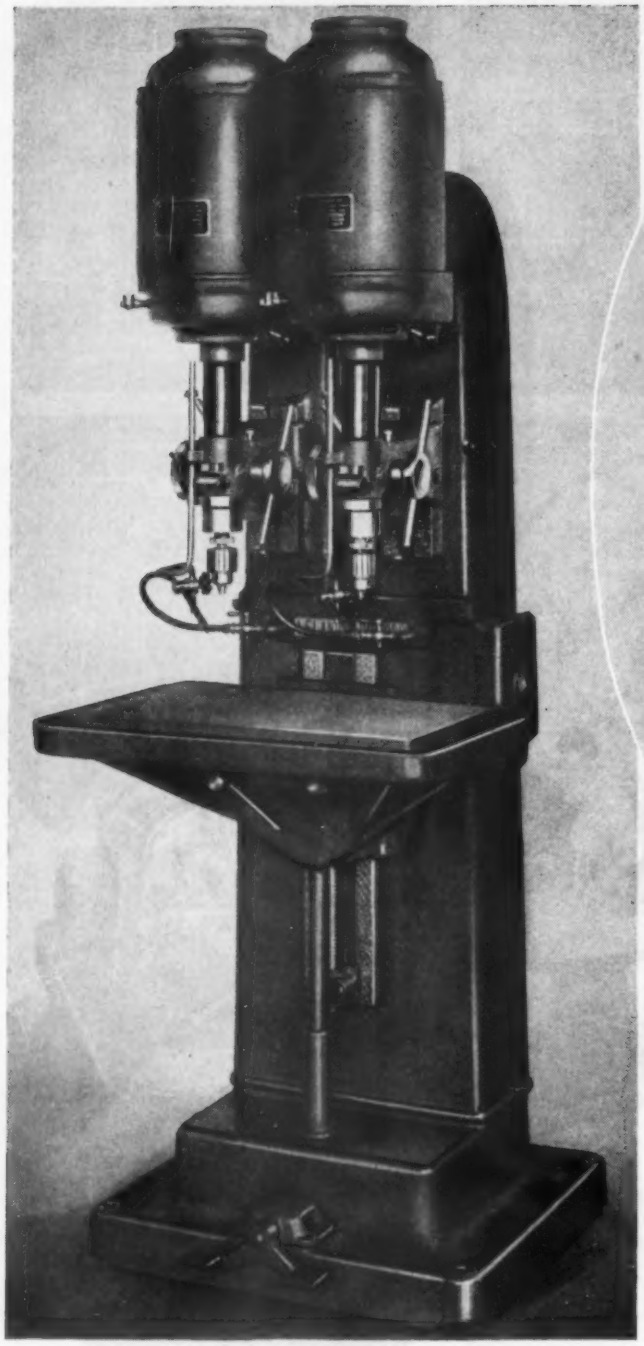
FIRST to provide absolute control of

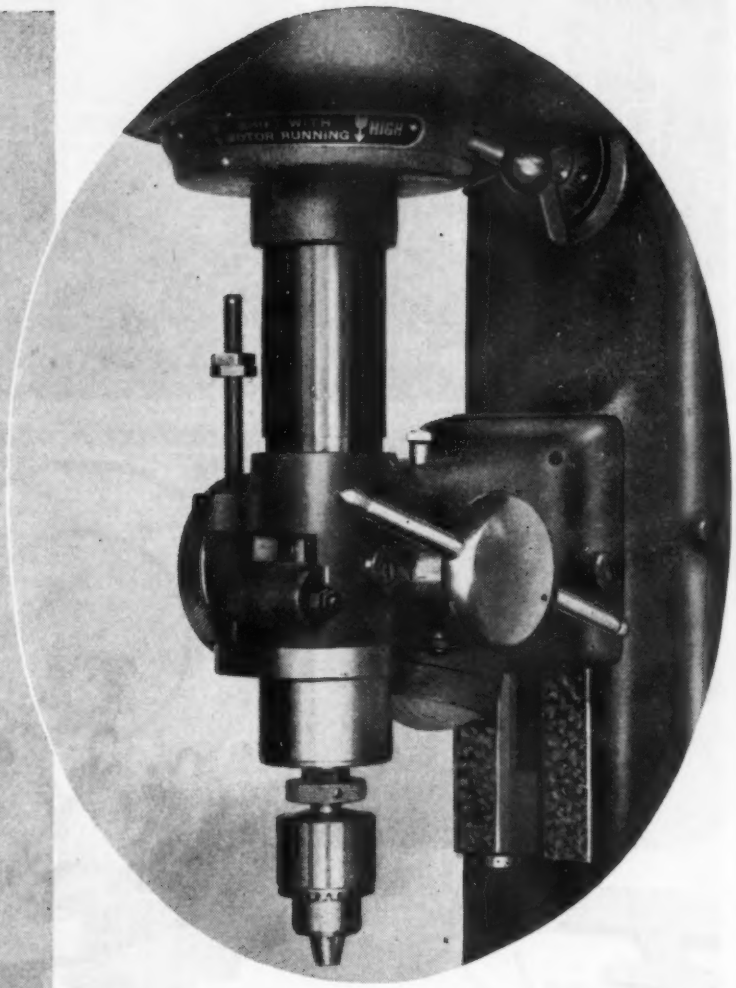
THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-CD MILLING CUTTERS





The SPINDLE in LELAND GIFFORD No. 1 LMS DRILLING MACHINE

has PRELOADED BALL BEARING MOUNTINGS TO TAKE RADIAL THRUST LOADS . . . . . .

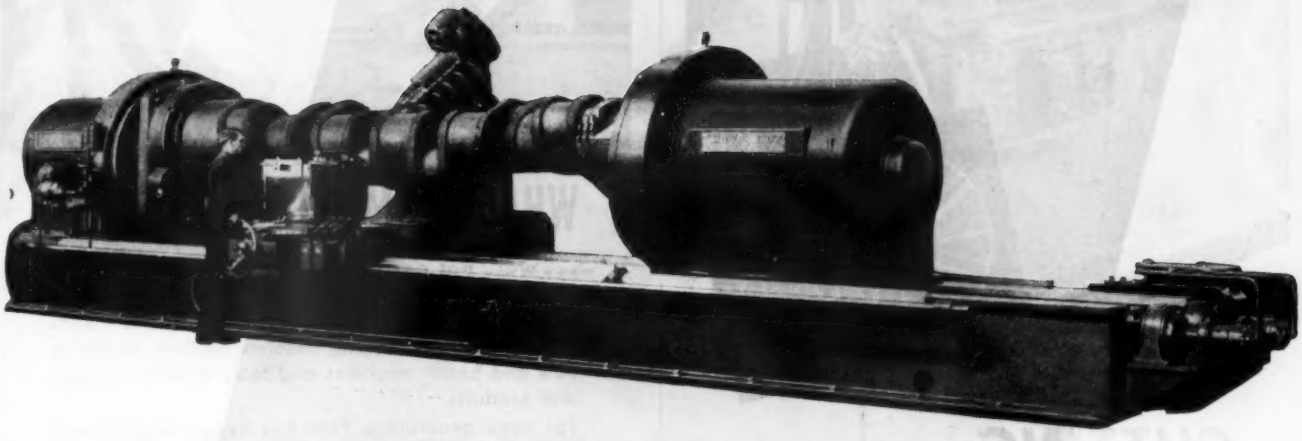
has Mist Lubrication, Six Hobbed Splines for driving, Hardened Spindle Nose to prevent damage from removing chuck, Telescopic spindle Guard to protect the operator from the multiple splines of this *Rugged* and *Extremely High Speed Spindle.*

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

Wickes UNIVERSAL CRANKSHAFT LATHES

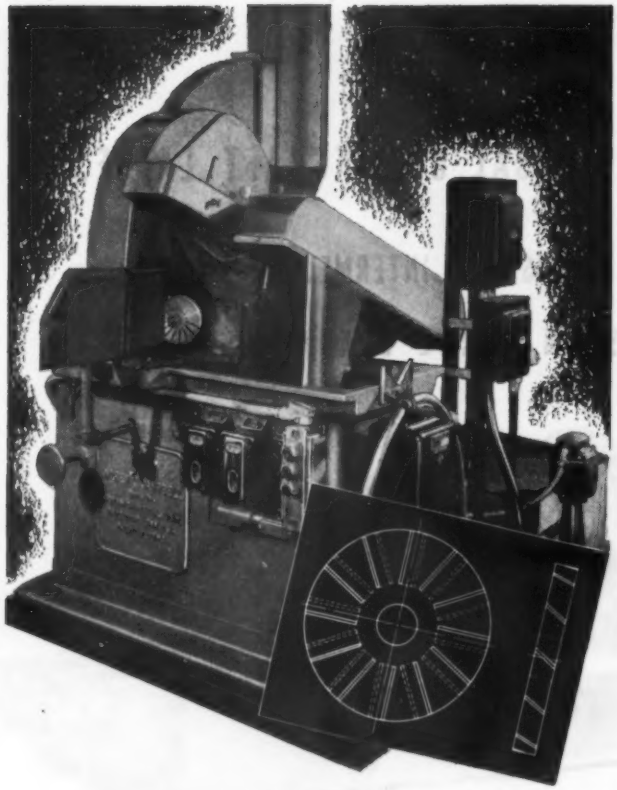
TURN ALL CRANKPINS AND INTERMEDIATE MAIN LINE BEARINGS ON LARGE CRANKSHAFTS



Wickes Universal Crankshaft Lathes are especially designed for machining main line bearings and crankpins on all sizes and types of crankshafts such as gas engine, automobile, tractor, airplane, and Diesel crankshafts. All crankpins and intermediate main bearings can be turned on a single machine of the Double End Drive type shown above in Model UH-60 size. All main bearings can be turned on a single machine of the Single End Drive type. All lathes equipped with independent hydraulic feed to the carriage and to the cross slide. Wickes Universal Crankshaft Lathes are built both Double End Drive and Single End Drive in four sizes (Models UH-4, UH-8, UH-60, and UH-72) for turning all sizes of Crankshafts.

WICKES BROTHERS . SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

CRANKSHAFT TURNING EQUIPMENT—CAMSHAFT TURNING EQUIPMENT—DOUBLE END BORING LATHES—HEAVY DUTY ENGINE LATHES—SPECIAL PRODUCTION LATHES—BLUE PRINT MACHINES



CUTTING PRODUCTION TIME
FROM MINUTES TO SECONDS

PROBLEM: To cut angular slots in a disc 8″ in diameter, approximately 1¼″ thick, going in from the periphery (see sketch). The material was heat-resisting stainless steel. The way the manufacturer was doing this job required a larger battery of machines to meet production requirements and it would take minutes to make each cut.

SOLUTION: A **CAMPBELL MODEL NO. 401 CUTAMATIC WET ABRASIVE CUTTING MACHINE** was rearranged to receive an automatic indexing fixture which compensates for wheel wear and depth of cut. The time required for cutting each slot (approx. 2 sq. in.) is 15 seconds. One operator can run all machines required for full production schedule.

★ ★ ★

Unusual? Yes. We are constantly adapting **CAMPBELL ABRASIVE CUTTING MACHINES** to do unusual jobs—or to do ordinary jobs faster, better or at lower cost. Perhaps we could solve a cutting problem for you. We'll be glad to talk it over.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

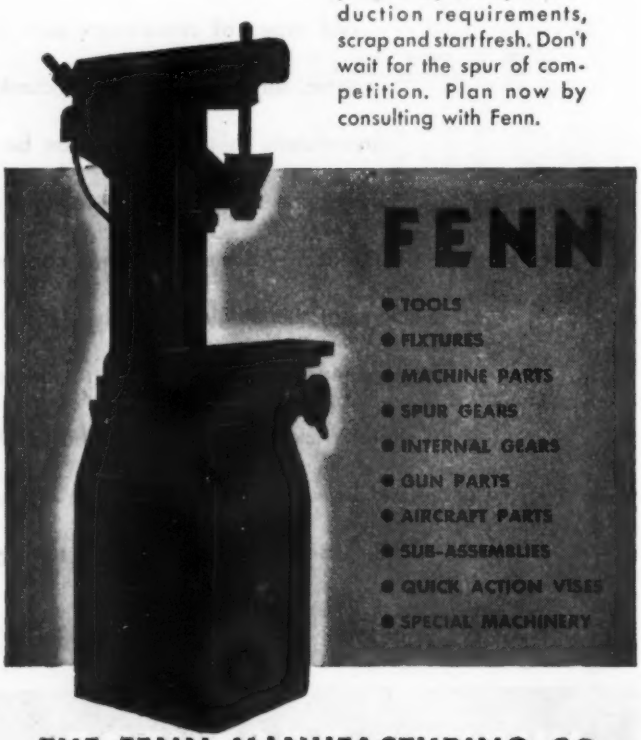
ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.

WHAT! A MONEY MACHINE?

. . . well, not exactly, but a manufacturer is plumb crazy if he doesn't explore every possible shortcut to more production at less cost. Frequently this means new machines; scrapping obsolete models; designing new and better machines and tools to turn out parts and products.

For three generations Fenn has been designing and building machines that lick production costs — hundreds of machines from printing presses to paper cup machines — each one saving time and money for the user.

If your present equipment is obsolete and inefficient judged by today's production requirements, scrap and start fresh. Don't wait for the spur of competition. Plan now by consulting with Fenn.



THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

Special Machinery For Efficient Production

ACCURACY BOOSTS PRODUCTION

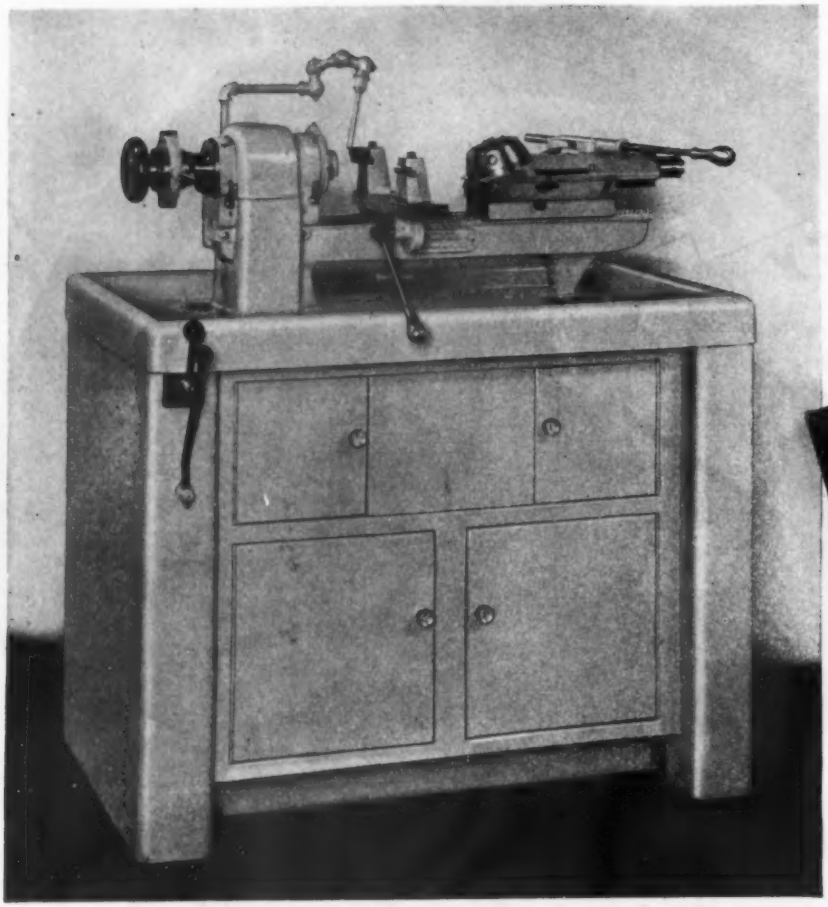
ABRASIVE M-34

NEW ACCURATE POWERFUL

ABRASIVE No. M-34 Surface Grinder with motorized vertical spindle is an extremely accurate and productive machine for precision work. The five H. P. motor, built-in directly on the spindle, minimizes vibration, eliminates belts and gears and provides ample power for heavy cuts. The massive one-piece bed casting, weighing over 1500 lbs., is very rigid and, like the 250 lb. table, is heavily ribbed to prevent distortion. Feeds are automatic and a built-in shock absorber eliminates shock of table reversal. Capacity is 24″ longitudinal, 8″ transverse, 12″ vertical.

Write for descriptive bulletin and prices.

ABRASIVE MACHINE TOOL COMPANY
East Providence 14, Rhode Island



PRECISION HAND SCREW MACHINE UNITS

You Can Speed Production and Reduce Costs On Precision Screw Machine Work With These Efficient Wade Units

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can do more work at a lower cost with Wade Standard Precision Hand Screw Machine Units for they are built especially for precision production operations. They are soundly designed and built to turn out extremely accurate work.

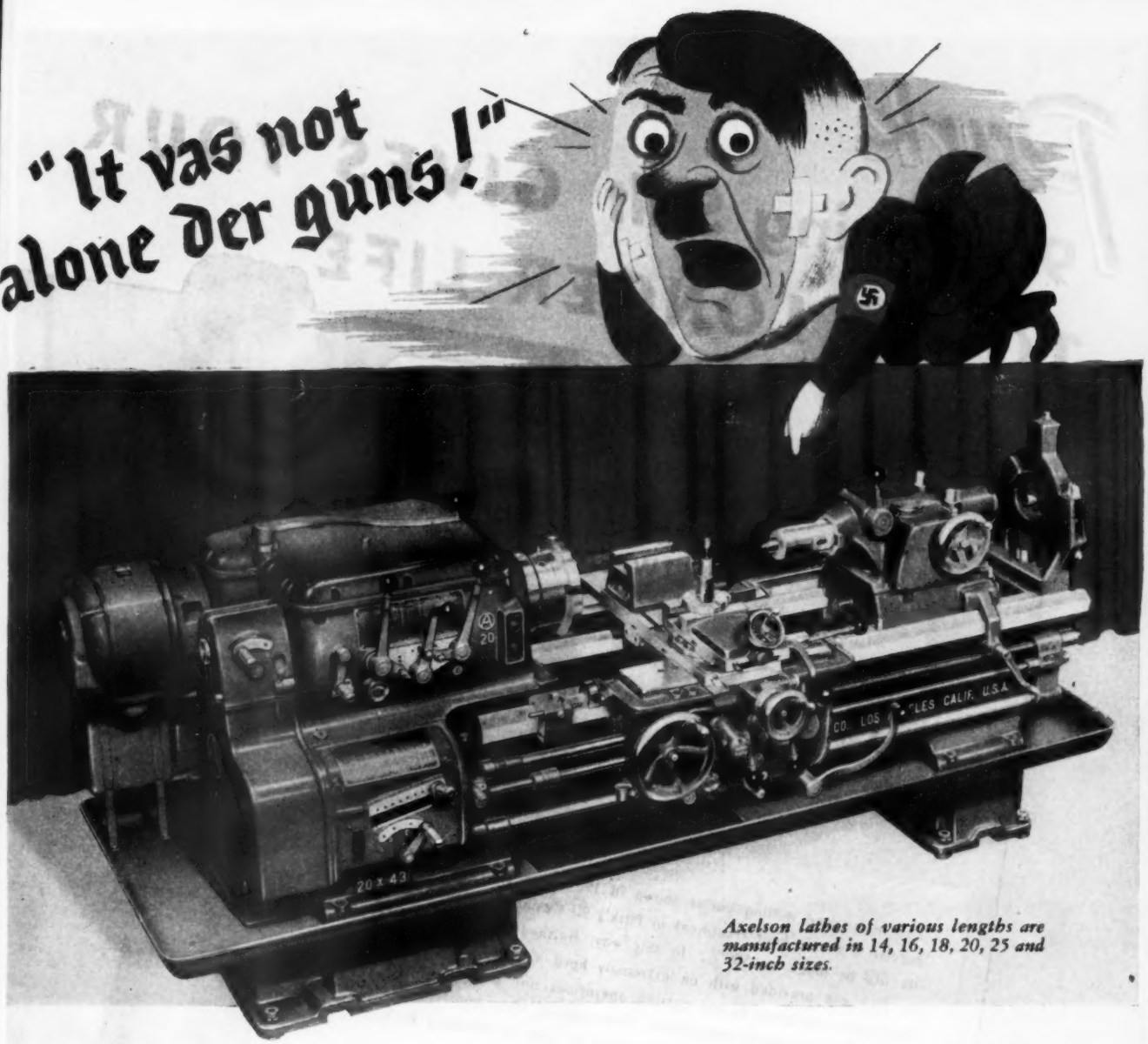
Some of the features of the Wade Standard Precision Screw Machine Unit are: Headstock has double row roller bearing. Lever Closer runs on ball bearing; operates positively to open or close collet with instant movement. Double Cross Slide movement 2¾"; provided with adjustable stops. Automatic Turret Attachment; Tilted self-clamping 6-station head; takes ¾" shank tools; Adjustable stops index automatically. Turret working travel 3¼"; indexing travel 1"; total 4¼". Unit has 32" bed. Collet cap: Model #5, ¾"; #7, 1". Weight, with steel cabinet, 650 lbs.

Write For Bulletins

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

"It vas not alone der guns!"



Axelson lathes of various lengths are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

It is with the fullest appreciation of the magnificent feats of arms by the fighting men of the United States and her Allies that the Axelson Manufacturing Company offers this advertisement. The fighters, with the merchant seamen and the civilians in war-torn countries, have faced death before the blast of Mars.

But the broken Hitler, seeking alibis, knows that the amazing performance on the Home Front, in production of guns, ships, planes, tanks and shells, kept always ahead of a constantly growing need. He knows that American Production, made possible by such supreme machines as the *Axelson Heavy Duty Lathe*, has turned the tide of battle from a dangerous lead first held by the Axis to a crushing superiority among the United Nations.

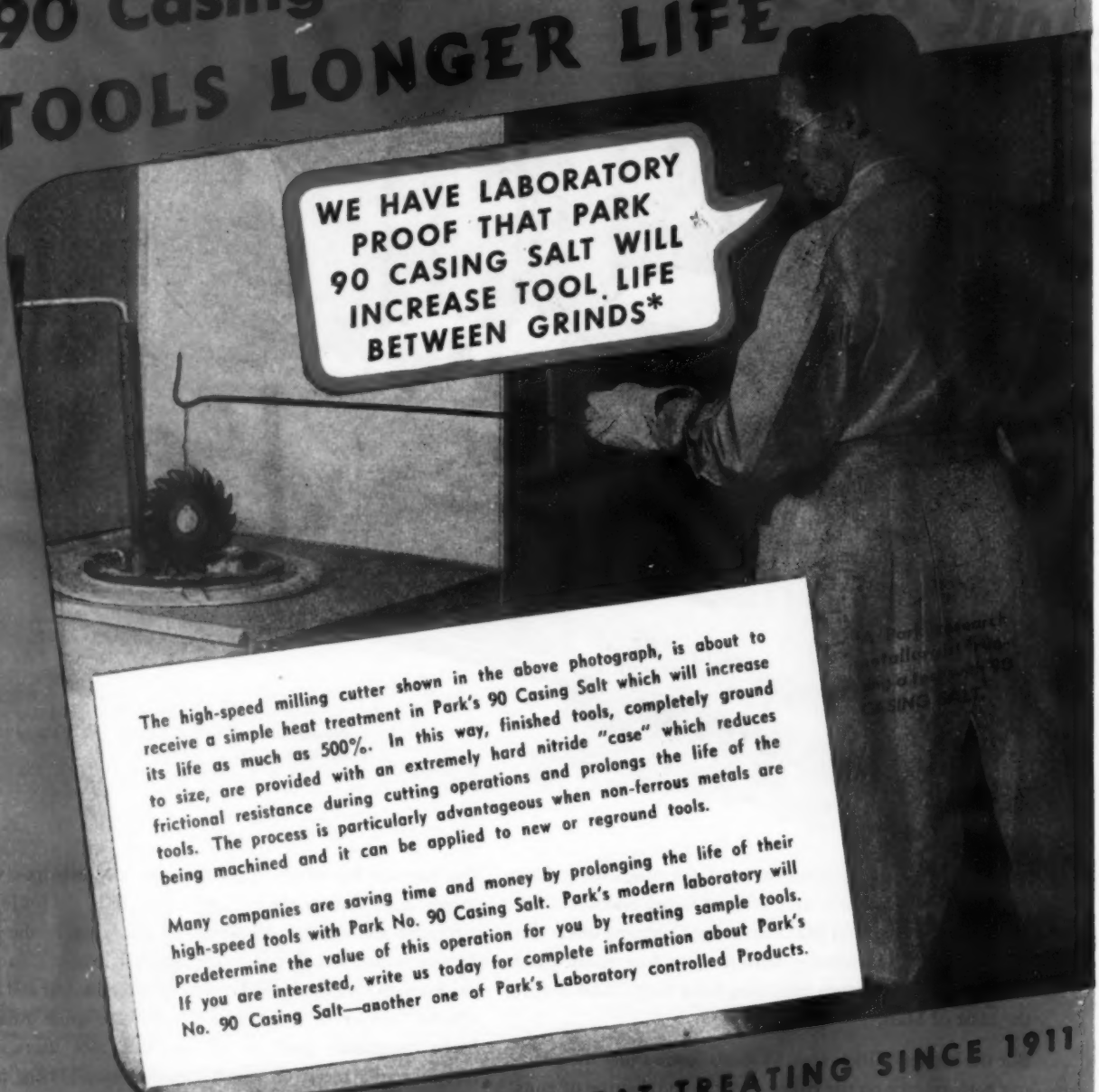
The Axelson Manufacturing Company acknowledges, with deepest appreciation, the toil and artisan skill, the pride and enterprise and effort represented, in war years, in the production which has flowed from its great lathes... In new purposes, to heal the wounds of the war-torn world and help rebuild "nearer to the heart's desire," the great Axelson Lathe commends itself to all machine tool users, who recognize the merit of the Axelson motto, "There is no Economical Substitute for Quality."

AXELSON MANUFACTURING COMPANY
6160 S. Boyle Avenue (Box 98, Vernon Station), Los Angeles 11, California
50 Church Street, New York City 7 • 3844 Walsh Street, St. Louis 16, Missouri

AXELSON LATHES
Dependable for over a Quarter Century

BUY WAR BONDS!

Park 90 Casing Salt GIVES YOUR TOOLS LONGER LIFE



The high-speed milling cutter shown in the above photograph, is about to receive a simple heat treatment in Park's 90 Casing Salt which will increase its life as much as 500%. In this way, finished tools, completely ground to size, are provided with an extremely hard nitride "case" which reduces frictional resistance during cutting operations and prolongs the life of the tools. The process is particularly advantageous when non-ferrous metals are being machined and it can be applied to new or reground tools.

Many companies are saving time and money by prolonging the life of their high-speed tools with Park No. 90 Casing Salt. Park's modern laboratory will predetermine the value of this operation for you by treating sample tools. If you are interested, write us today for complete information about Park's No. 90 Casing Salt—another one of Park's Laboratory controlled Products.

★ SPECIALISTS IN HEAT TREATING SINCE 1911

Park

PARK CHEMICAL CO.
DETROIT

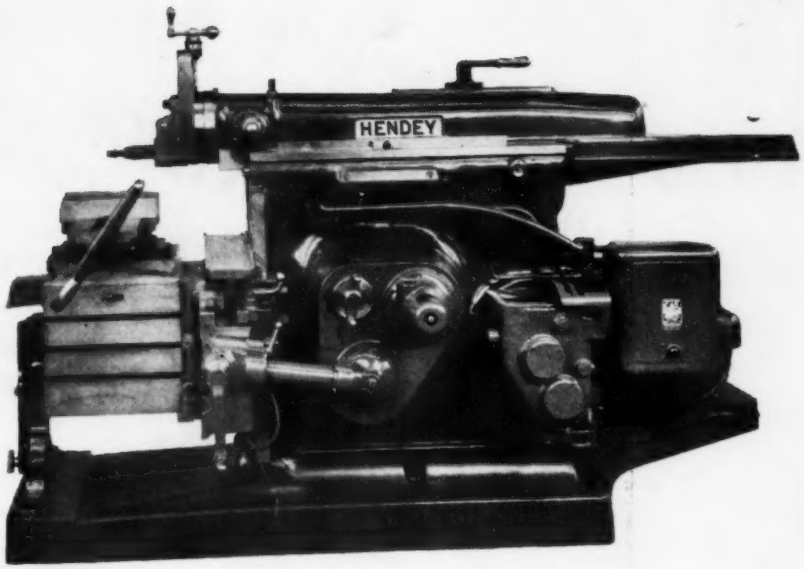
● Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

4807 MILITARY AVE. DETROIT, MICH.

FEATURING

The Hendey

16-inch Heavy-Duty Motor Powered CRANK DRIVEN SHAPER



MECHANICAL DETAILS

Length of Ram	46"	Size of Table Top	14" x 20"
Strokes per minute	10 to 130	Horizontal Travel of Table	24"
Speed Changes	8	Vertical Travel of Table	14½"
Vertical travel of tool slide	7"	Power Cross Feed Range	.005" to .120"
Power Down Feed Range	.005" to .060"	Net Wt. with motor, approximate	4800 lbs.
Size of Tool Opening	1¾" x ⅞"		

Hendey 16-inch Crank Shaper installed is the shops of a manufacturer of fine instruments, being used for exacting tool work.

This shaper has automatic lubrication applied to entire driving mechanism, also force feed lubrication to ram ways, rocker arm ways, crank pin and block, and the feed mechanism.

Crank gear hub runs in massive Timken bearings which are preloaded, following approved engineering practice.

Shaper may be furnished with power rapid traverse, motor driven, with lever controls at both ends of cross rails.

Universal Table may be furnished, with 360 degree rotation, together with tilting top which will elevate to 15 degrees either side of horizontal.

When supplied with motor drive, the motor for this shaper will be 5 H.P., constant speed, non-reversing, minimum speed of 1200 and maximum speed of 1800 RPM.

1874 — *71 years employed in the manufacturing of machine Tools demanded by critical users who have always wanted the best.* — 1945

THE HENDEY MACHINE CO.

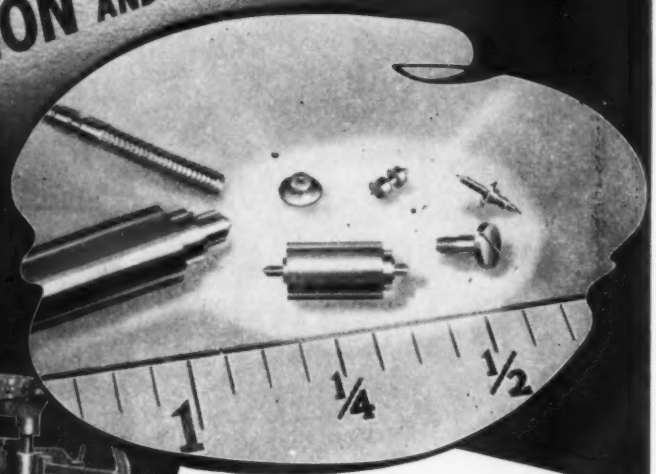
TORRINGTON, CONN.

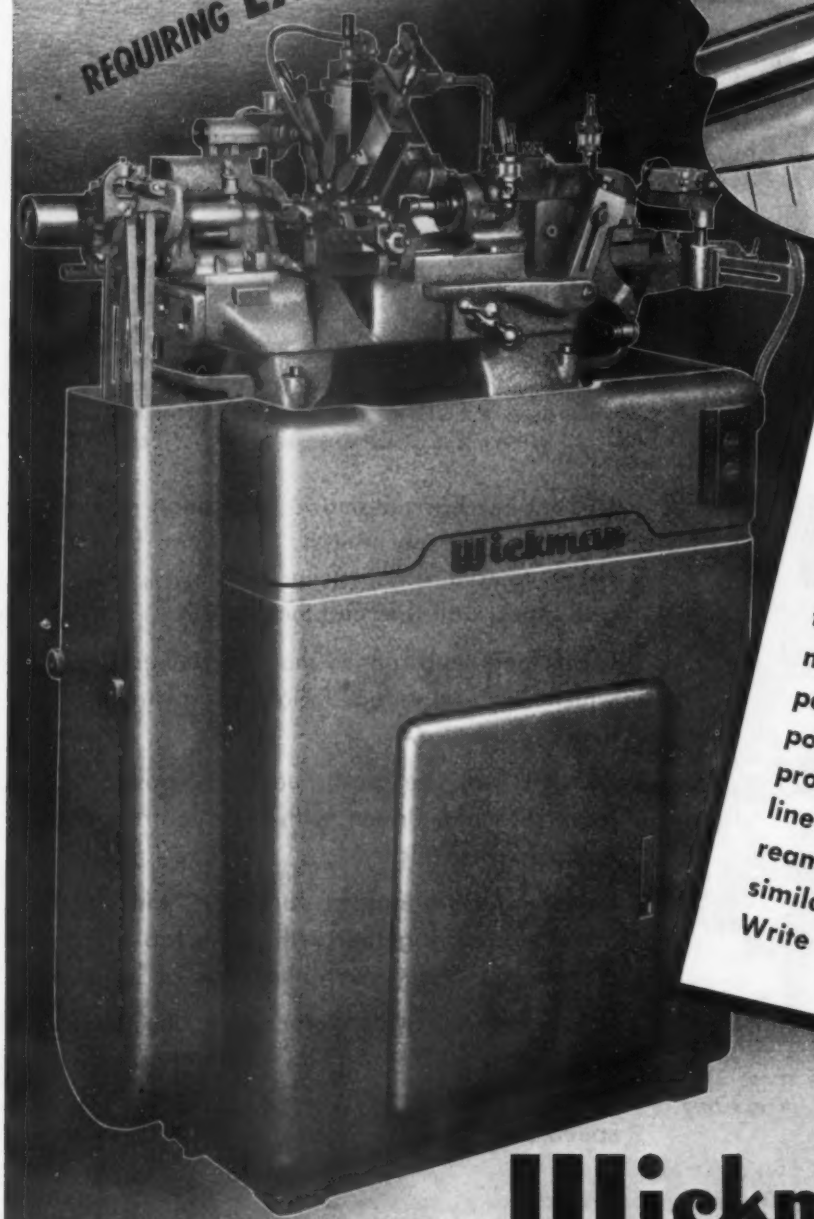
BOSTON NEW YORK ROCHESTER CHICAGO DETROIT

For Production

OF SMALL SLENDER PARTS

REQUIRING **EXTREME PRECISION** AND **FINE FINISH**





THE WICKMAN MACHINE
With 5/32" Capacity

The Wickman No. 1 Swiss Type Automatic employs the Swiss Principle of coordinated, cam-controlled headstock and radial tool movements to generate the most intricate forms with single point tools. Tapers, bevels, pivot points, back shoulders, etc., are produced in one operation. A full line of attachments for drilling, reaming, threading, tapping and similar operations is available. Write for complete information.

Wickman No 1
SWISS TYPE
HIGH PRECISION AUTOMATIC

THE Wickman CORPORATION

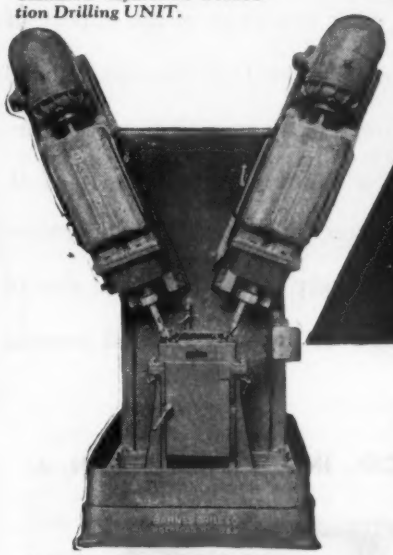
15539 WOODROW WILSON AVE., DETROIT 3, MICH.
A. C. Wickman (Canada), Ltd., P. O. Box 9, Station N, Toronto, Ontario

Why Not Reduce Investment and Operation Costs on Special Drilling Operations...

(Above) BARNESDRIL Standard Hydraulic Production Drilling UNIT.

(Above) BARNESDRIL 4-UNIT No. 10 Vertical Drilling, Reaming and Counterboring Machine. 80 spindles are employed for machining aluminum aircraft pump housing.

...by Adapting BARNESDRIL Standard Hydraulic Units to Your Work



(Above) BARNESDRIL 2-UNIT No. 10 Angular Drilling Machine used for drilling and counterboring 12 holes in propeller shafts.

The "special" production machines shown on this page are all built from BARNESDRIL Standard Hydraulic UNITS mounted on the proper columns, horizontal beds and supports. Since these BARNESDRIL UNITS are self-contained and complete in themselves, considerable savings in engineering and development costs are realized by their use in the construction of these machines.

The applications illustrated are typical of the numerous ways in which standard BARNESDRIL UNITS can be profitably adapted to your special drilling, reaming and facing requirements. BARNESDRIL UNITS can be arranged in one or any combination of vertical, horizontal or angular positions or grouped around a hydraulic indexing table for progressive operations.

Each UNIT is equipped with a single motor, which drives the spindle rotations and hydraulic pump for any desired automatic, hydraulic feed cycle. The flange support of the BARNESDRIL UNIT allows easy mounting of interchangeable, auxiliary heads with the required number and arrangement of spindles. In this way, you realize appreciable savings in machining and handling time.

BARNESDRIL High Production UNITS are now available in the following sizes, and each is motorized according to requirements of the job.

No. 5 Unit...with 5 to 7½ hp. Motor
No. 10 Unit...with 10 to 15 hp. Motor
No. 20 Unit...with 20 to 25 hp. Motor

COMPLETE INFORMATION AVAILABLE

Although these BARNESDRIL Units have been specifically designed for your present needs, they can easily be converted to meet future requirements. For more complete information on how BARNESDRIL UNITS can be economically adapted to your work, send for your free copy of Bulletin A-150.

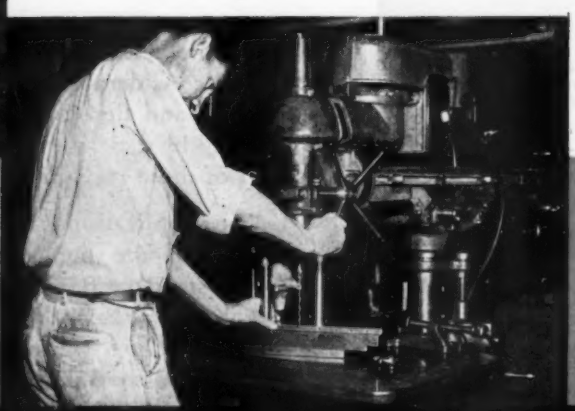
Barnes Drill Co.

830 CHESTNUT STREET
ROCKFORD
ILLINOIS, U.S.A.

WALKER-TURNER·MACHINE TOOLS PROVIDE A BALANCED PRODUCTION LINE FOR FAIRCHILD CAMERAS

At Fairchild Camera and Instrument Corporation, production lines require quick changes in operations. Drilling, tapping, reaming, and counter-boring of all sizes of aerial camera parts are some of the important jobs assigned to Walker-Turner Drill Presses. These rugged, simple tools are readily moved from one department to another, or within departments, as needed. Because of Walker-Turner flexibility, all operation changes can be made quickly — regardless of size of part. Thus a steady flow of urgently needed camera parts is maintained.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.



15" DRILL PRESS drilling and reaming holes for locating pins on Fairchild aerial camera lens cone. One of many Walker-Turner Drill Presses in this plant

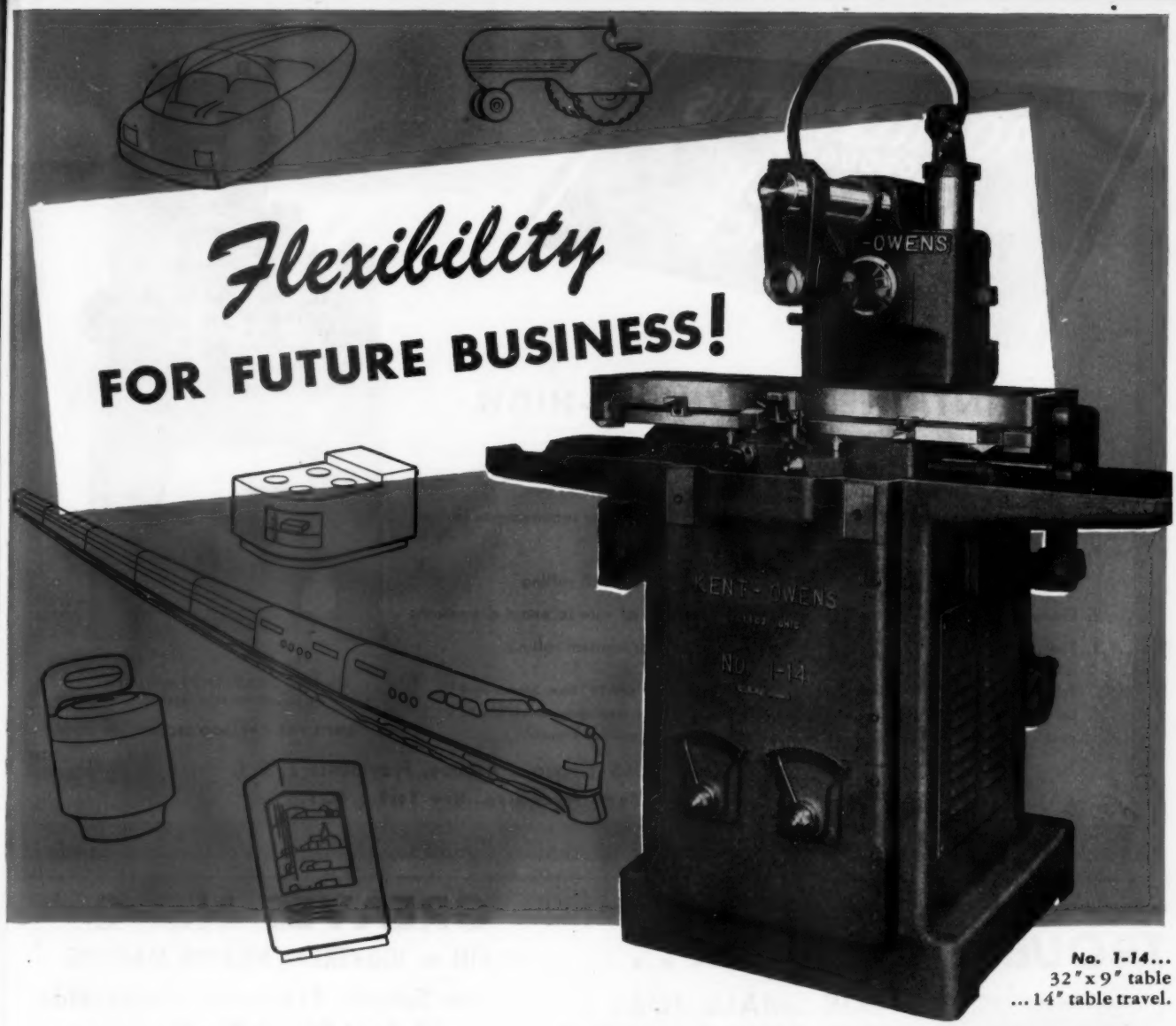
•

WALKER-TURNER RADIAL DRILL drilling Fairchild Sound Recorder drive assembly. Easily maneuvered for drilling large castings. Tilting head eliminates need for angle vice and special set-up in drilling angled holes.

walker-turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



No. 1-14...
32" x 9" table
...14" table travel.

★ To meet critical demands for faster production—depend on Kent-Owens Machines for milling operations! Through long experience—shop men know these machines deliver unbeatable performance in meeting tough schedules.

The same features that have proved so practical, efficient and dependable in production for war—make Kent-Owens Machines especially valuable for speed and economy in after-the-war competition. Adaptable to a wide range of work. Rugged . . . simple . . . efficient. Write for latest bulletins. Kent-Owens Machine Co., Toledo, Ohio.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co.

INDIANAPOLIS
Oatis-Booth Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Davies Machinery Company
Harron, Rickard & McCone

MILWAUKEE
Neff, Kohlbusch & Bissell

MINNEAPOLIS
The Satterlee Company

MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Machinery Co.

NEW ORLEANS
Oliver H. Van Horn Co.

NEW YORK
Harrington-Wilson-Brown Company

PHILADELPHIA
Calco Machinery Company

PITTSBURGH
Barney Machinery Co.

ROCHESTER
F. W. Schiefer Machinery Company

SAN FRANCISCO
C. F. Bulotti Machinery Co.

ST. LOUIS
Blackman & Nuetzel Machinery Company
Clarke Equipment Co.

SYRACUSE
J. F. Owens Machinery Co.

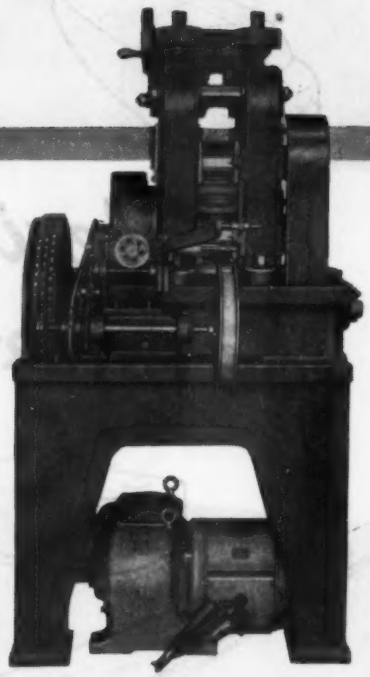
TORONTO
F. F. Barber Machinery Co.

WALKERVILLE
F. F. Barber Machinery Co.

Call on KENT-OWENS *for Milling Machines*

40 MILLIONTHS (.000040) OF AN INCH TOLERANCE

MAINTAINED BY THIS 4-HIGH "Standard" ROLLING MILL



2, 3 or 4 High "Standard" Mills built to specific customer requirements for —

1. Hot and cold rolling of metal strip, rod and ingot
2. General sizing and embossing
3. Precision rolling of strip
4. Grading
5. Cross and pinch rolling
6. Forming of wire to exact dimensions
7. Single or tandem rolling

Roll sizes range from 1½" diameter and 1" face to 16" diameter and 18" face. Speeds may be provided from 10' to 500' per minute. Attachments include running-in tables, single, double and triple edgers, payoff reels, takeup reels, straighteners and Turks Heads.

EXTRA PRECISION 4-HIGH LIGHT DUTY MILL

WRITE FOR CATALOG SECTION RM

STANDARD MACHINERY CO., 1565 Elmwood Avenue, Providence 7, R. I.

Export Department: 1111 South Ferry Bldg., New York 4, N. Y.

TROUBLE-SHOOTER . . .

FOR SMALL JOBS IN BUSY SHOPS

The high cost of doing small jobs on large machines can be eliminated with a Linley on your floor. This sturdy little vertical Milling and Jig Boring unit has the compact ruggedness, the speed and accuracy and the quick changeover features you need.

Dies, jigs, models, metal patterns, etc., are handled in rapid succession at low cost. There are 8 spindle speeds to 4250 r.p.m.; velvet feed, direct micrometer setting. Quill backlash is eliminated; bearings are grease-sealed; table size 7"x17½"; floor space 18½" x 20".

As a trouble-shooter, the Linley is tops . . . a precision machine that gets things done . . . at a profit.

ASK US FOR BULLETIN

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

GREAVES No. 2

PLAIN or UNIVERSAL MILLING MACHINE

. . . for Speed, Accuracy, Production and Tool Room Work . . .

featuring:

- Power Feeds, all Directions
- Rapid Traverse—6-way
- Alloy Hardened Gears
- One Shot Lubrication to Table, Saddle Slides and Screws
- All Speed and Feed Changes through Positive Gearing
- All Speed and Feed Gearing run in Oil
- Timken Bearings
- Glass Sight Oil Control
- Unit Construction
- Central Control Position for all Operation Levers
- Coolant System

Specifications

Table—52¼" x 12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse — Longitudinal — cross and vertical—All directions—75" per minute
Weight—3750 lbs.

Send for illustrated literature giving complete information.
Write for nearest agent or dealer

Exclusive Distributors

H. LEACH MACHINERY CO.
387 CHARLES STREET PROVIDENCE, R. I.

2 MACHINES REPLACE 27 STANDARD TYPE DRILLS

in Performing 80 Drilling, Reaming and Spot Facing Operations on Engine Mounts

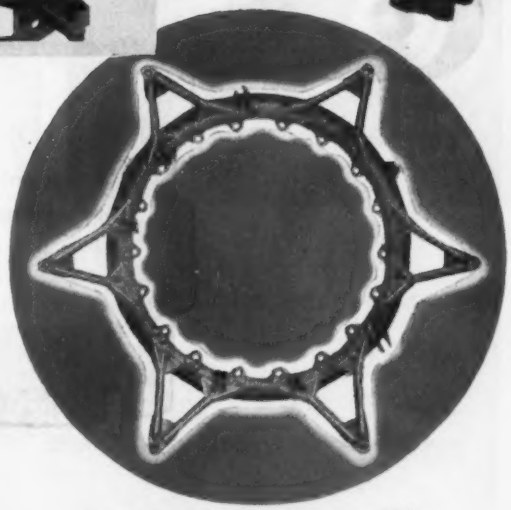
Barnes standard 914 unit-type machines with vertically mounted 8-spindle multiple heads and angular mounted 2-spindle multiple head. Insets show work fixture and arrangement of spindles. Cycling time for each machine is 20 minutes.

● Substantial savings in time, equipment and manpower are accomplished by this very prominent manufacturer in drilling, reaming and spot facing operations on engine mounts, which were previously performed by 27 standard type machines.

In 20 minutes on each machine, including set-up time, 48 holes on one side of the engine mount, and 10 holes on the other side, are automatically drilled, reamed or spot faced by two Barnes standard 914 unit-type machines. One machine is equipped with two 8-spindle multiple heads, while the other has one 8-spindle multiple head and one 2-spindle multiple head. Special fixtures on manually operated rotary tables hold the work piece. Tolerances of .002" between holes are accurately held.

Here is a typical example of how Barnes unit-type machines built from standard hydraulic feed and drive units can be arranged to accomodate unusual machining jobs.

Barnes' engineers are skilled in designing and building special machine tools for drilling, boring, milling, tapping, etc. for high production metal working problems. A complete analysis of your production problems and recommendations by Barnes' engineers is without obligation, of course.



Front view of engine mount on which 80 holes are automatically drilled, reamed and spot faced by the two Barnes standard 914 unit-type machines shown above.

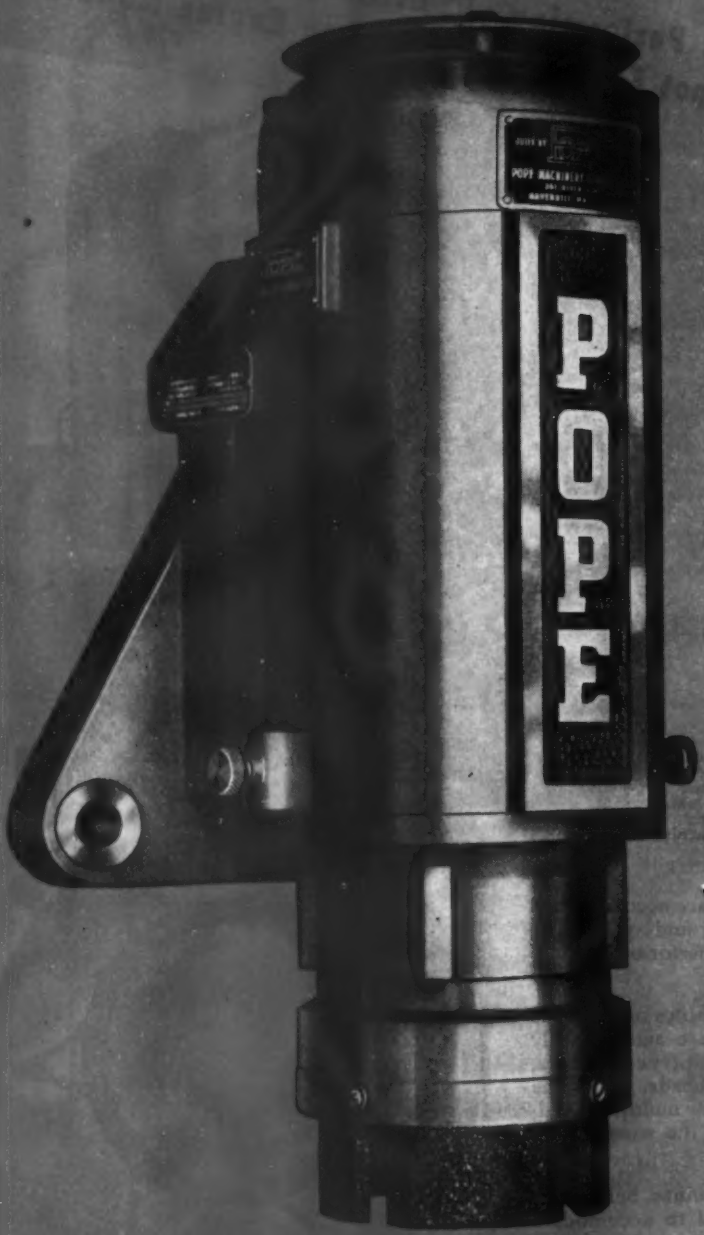
W. F. & JOHN BARNES

***Write** for Bulletin No. 445 — a 12 page folder describing and illustrating the Barnes 914 standard unit-type machine.*

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Picture This POPE PRECISION SPINDLE *on Your* MACHINES



This POPE Vertical Motorized Spindle with *sealed lubrication*, totally enclosed, fan cooled motor and super-precision bearings means *better work and more of it.*

The coolant is fed down through the hollow spindle, cooling motor and bearings on its way to the inside of the cup wheel where it is most effective for cooling the work.

This Spindle, like all POPE Precision Grinder Spindles, will give you more production and finer finishes. Ask us to send you Data Sheet A from which we can furnish recommendations and estimates.

POPE Vertical Spindles are available with 3, 5, 7½ or 10 HP Motor. Speed may be 600, 750, 900, 1200, 1800 or 3600 RPM, 60 cycle AC current. Even higher speeds are attainable with frequency changers.

POPE Vertical Motorized Spindles are used not only for surface grinders but for a variety of other purposes. Where, working loads are largely radial, bearings are arranged to take care of them.

POPE

REG. U. S. PAT. OFF.

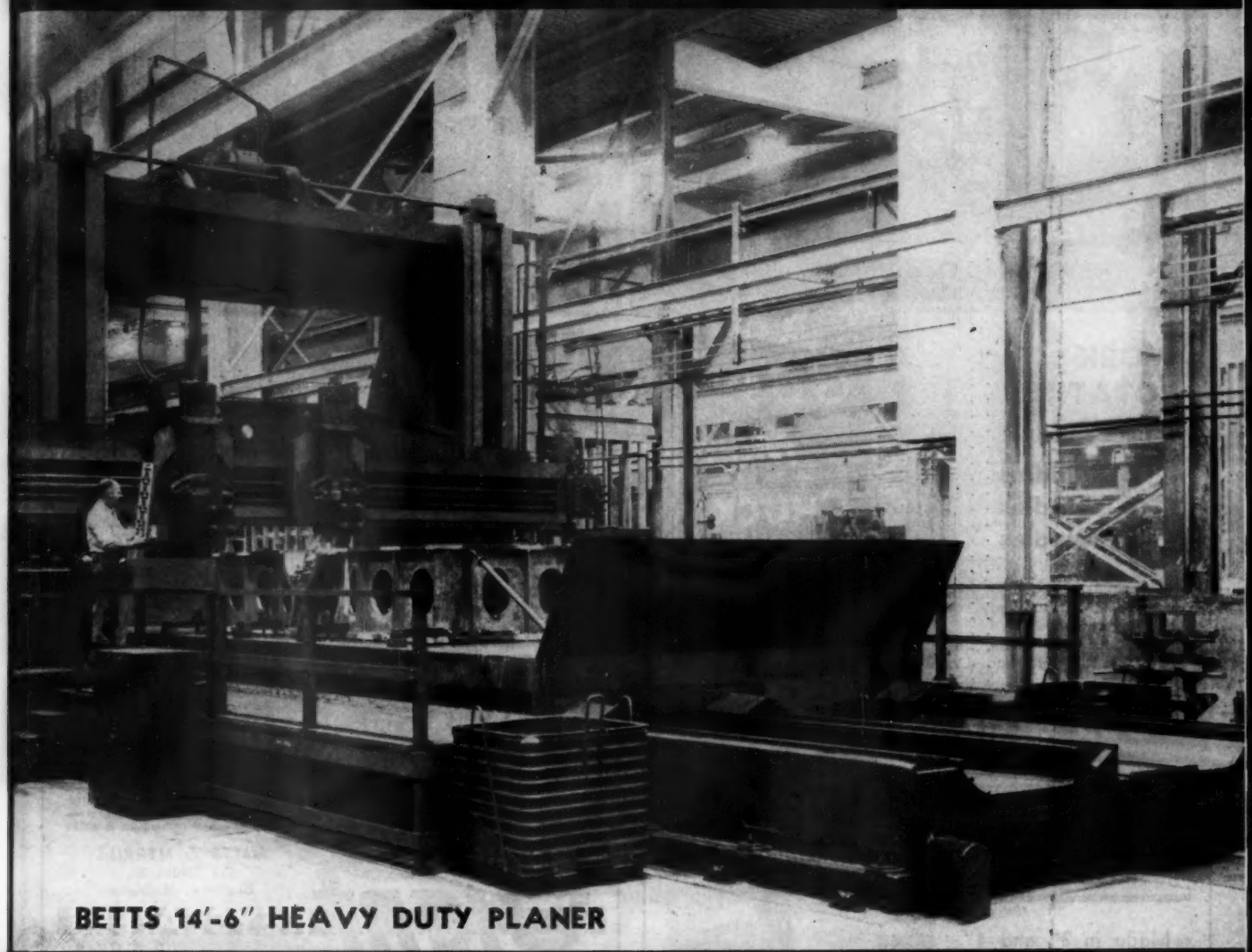
POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

WHEN LOWER COST PRODUCTION REPLACES COST PLUS..



BETTS 14'-6" HEAVY DUTY PLANER

PLANING TURBINE HOUSINGS IN A WELL-KNOWN INDUSTRIAL PLANT

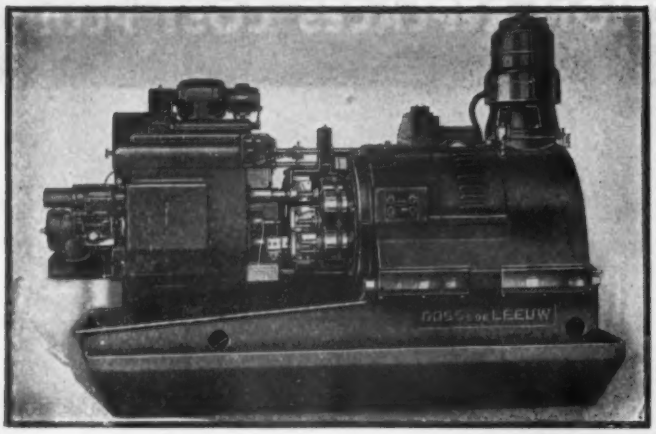
Consolidated Machines, designed and built for maximum economical production, offer you a foundation for meeting post-war competition on a profitable basis. Whether your problem needs answering today, or you are trying to reach the solution for a post-war development, you should find it worth-while to investigate Consolidated Heavy Machine Tools.

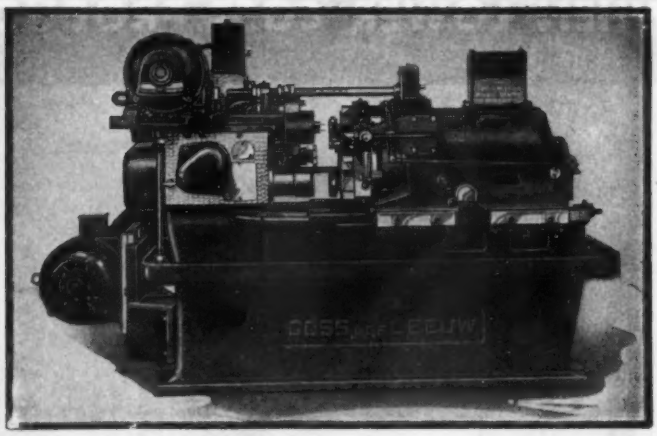
BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

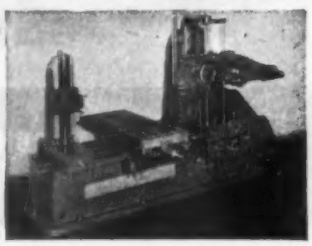
Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

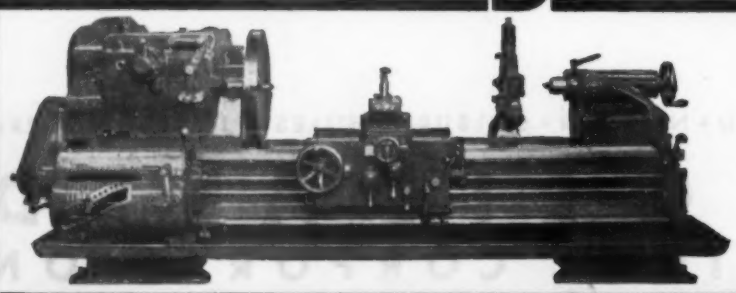
Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

SPRINGFIELD GEARED HEAD LATHES

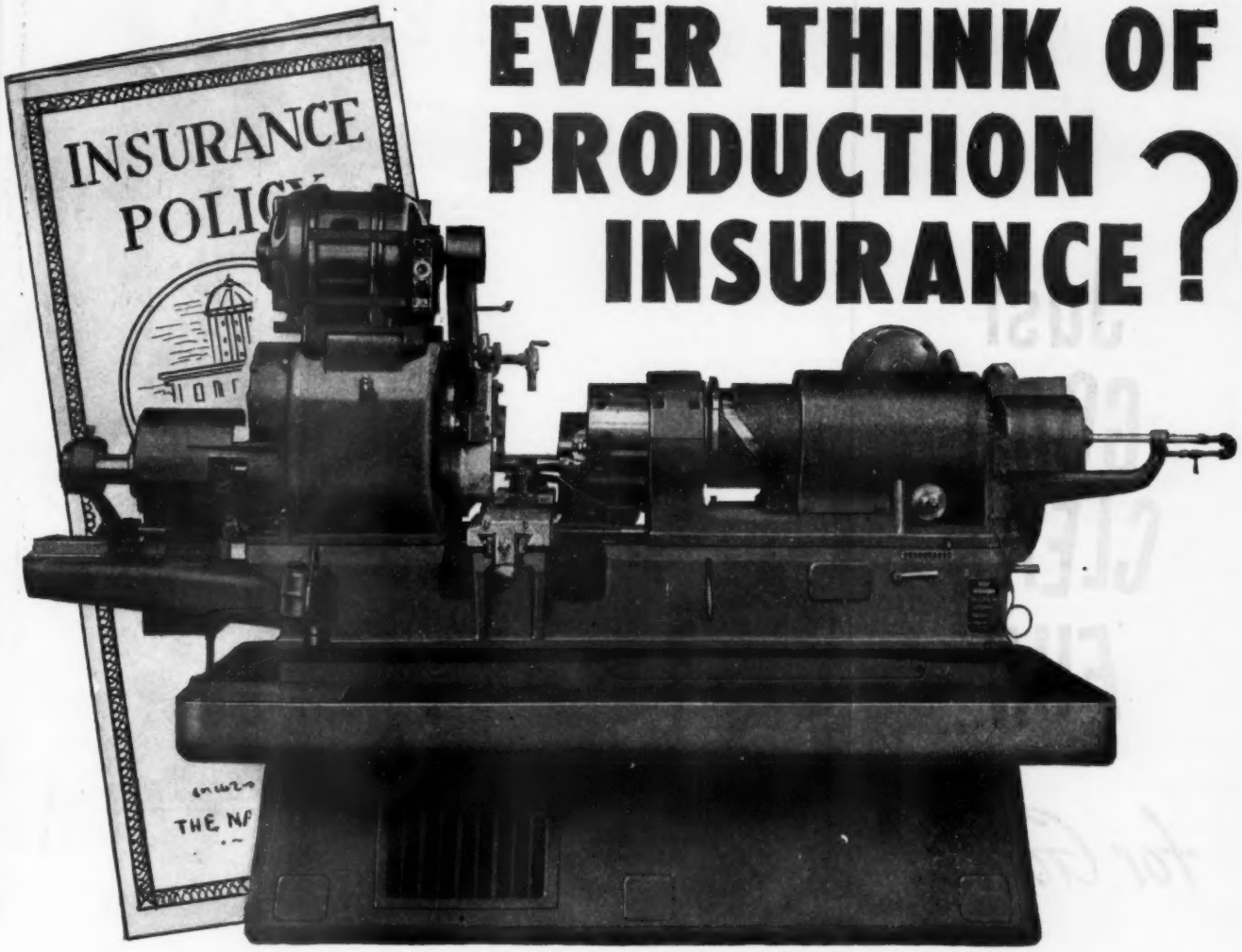


for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

EVER THINK OF PRODUCTION INSURANCE?



THIS new Cleveland Automatic will bring many years of high production efficiency to a modern plant, but . . .

What is the "life expectancy" of the present equipment upon which *you* are depending to maintain production and sharpen profit in the critical and competitive days ahead?

Forward looking production heads are *today* making realistic analysis of every machine on their floors to determine . . .

1. What has been the actual working life of each, based on a ratio of round-the-clock schedules, to maintenance manpower shortage, to skilled operator shortage . . .

2. What is the ratio of decreasing production efficiency to rising maintenance time on these prematurely aged machines as compared to new equipment.

In many plants these comparisons result in new equipment programs *as insurance against production failures.* Cleveland Production Engineers would like to help *you* make comparisons of new Cleveland Automatics with equipment you are now using, on a basis of itemized production costs on specific jobs . . . Let us show you why Clevelands are good "production insurance".

Remember... Clevelands Cut Costs

CHICAGO (6):
1408A Civic Opera Building

DETROIT (2):
540A New Center Building

NEWARK (4):
902A American Insurance Bldg.

CINCINNATI (12):
4932A Beech Street

HARTFORD (1):
529A Capital National Bank Building

THE CLEVELAND AUTOMATIC MACHINE CO.

Just GOOD CLEAN FUN...

for Goats!

But it's no fun for management and production men in "no-count" plants. For without a *continuous count* of turns, strokes, operations, pieces, or other units of machine-performance, there's no sure way of telling whether you're up to schedule or behind it. And that leads head-on into a brick wall of doubt and uncertainty... which pays off in the lumps and bruises of miscounts, delays, errors, shortages or surpluses. But how to get an accurate, continuous count? Simply equip each production machine with a Veeder-Root Counting Device, either mechanically or electrically operated according to need... and you will know where production stands on every machine, every moment. Then you can immediately detect and correct any slowdown or other mechanical difficulty as soon as it begins to develop. This is the modern system of Veeder-Root *Count*rol... which can be applied to cover all *your* war-production operations... quickly, inexpensively, and without interrupting plant routine.

The Counting House of Industry

VEEDER-ROOT INCORPORATED

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)

THERE'S NO NEED TO "OVER-REACH" IN OPERATING THIS MACHINE

The BAKER unit shown below . . . a standard BAKER 65-HH hydraulic feed floor type unit . . . was furnished to a well-known automotive manufacturer for multiple drilling main bearing caps. BAKER Engineers worked out a special arrangement for the job, including such special features as these:

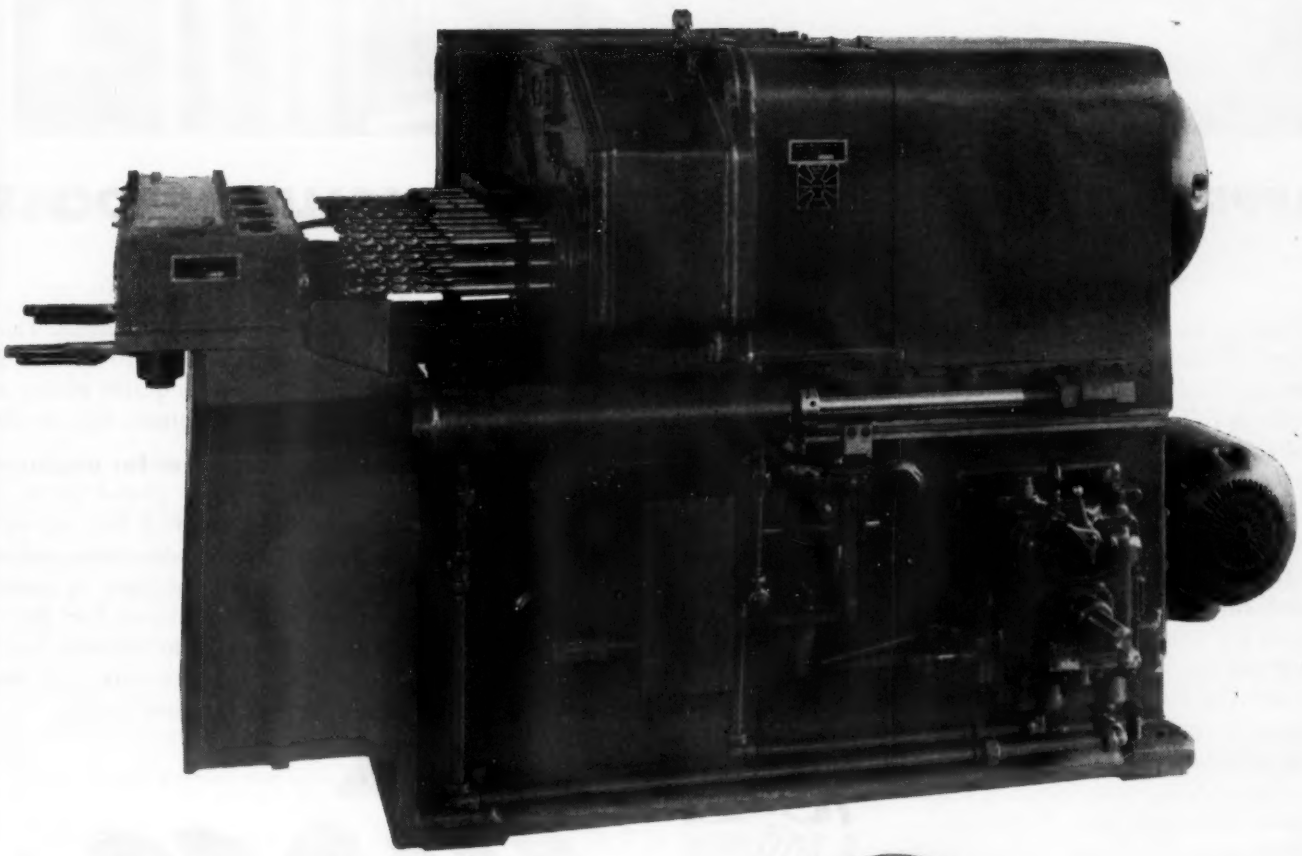
Heavy-duty fixed center sixteen-spindle multiple head with simplified direct drive from main drive motor.

Special quick-acting work-holding fixture.

Unique arrangement of controls permits operator to load, operate and unload machine from one position.

Automatic cycle of rapid traverse, automatic engagement into feed, automatic trip at adjusted depth and return of complete head to rear position.

BAKER engineering consultant service is available to help solve *your* special problems, too. Write.



BAKER Bros., Inc.

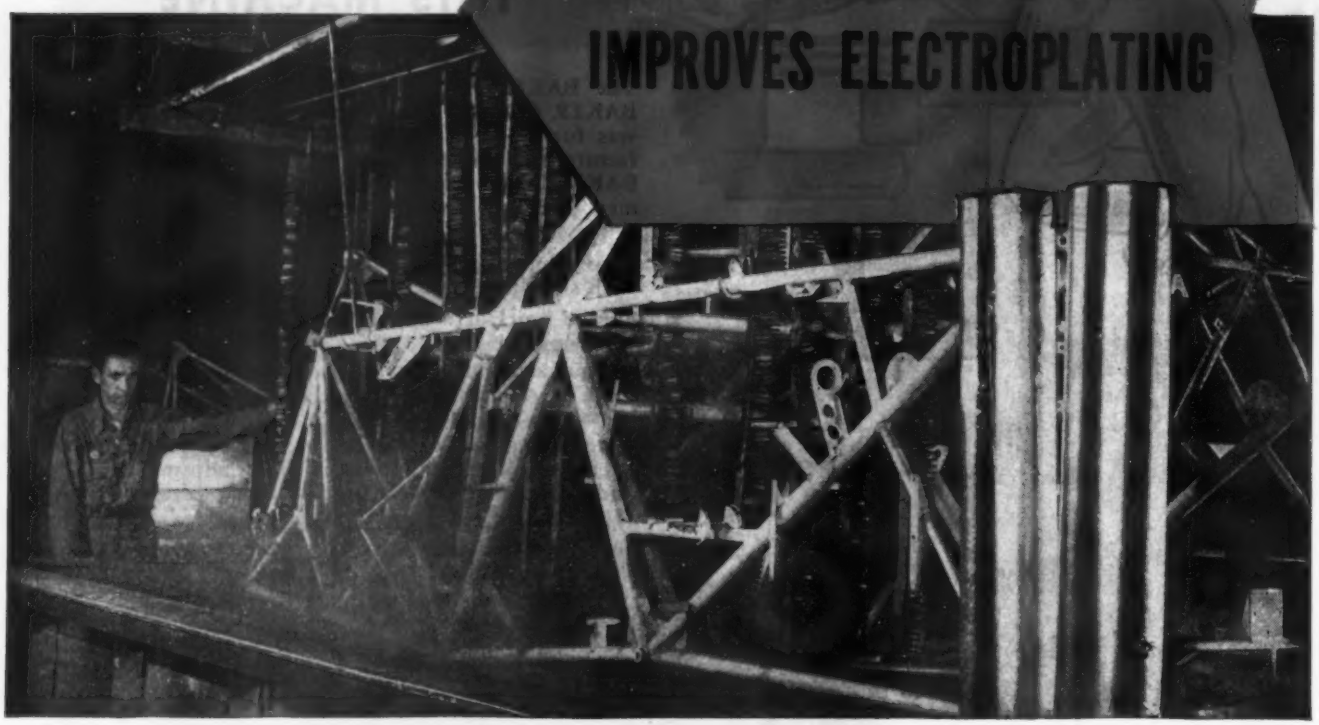
Single and Multiple Spindle Machines for Drilling, Boring and Tapping

TOLEDO 10, OHIO

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



APPROVED FOR THE BULLARD-DUNN DESCALING PROCESS

Equally effective in still tank and electro-cleaning

So positive are the advantages of Turco Prosolv *B* that prominent electroplaters have switched to this new cleaner immediately following tests *although they had considered satisfactory the materials they had been using.*

Turco Prosolv *B* insures the chemical and physical cleanliness that is essential to 100% bonding to steel of zinc, cadmium, chromium and other plate. It removes every trace of oil, grease, smut, paint and rust preventive compound. It contains no soap; leaves no deposit. Rinsing is complete, even though parts may have dried.

A highly concentrated product, Turco Prosolv *B* is 100% active. Every particle works; there is no waste.

As this new cleaner is effective in both still tank and electro cleaning, it simplifies stocking and plant procedure where both processes are employed.

Try Turco Prosolv *B* for stripping tin deposits formed during the Bullard-Dunn descaling process. A standard cleaning tank may be used for this. Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv *B* with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attaching the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

TURCO

Write Dept. AM-4

Turco PRODUCTS, INC.

SPECIALIZED INDUSTRIAL CHEMICAL COMPOUNDS

MAIN OFFICE AND FACTORY: 6135 SOUTH CENTRAL AVE., LOS ANGELES 1 • SOUTHERN FACTORY: 1606 HENDERSON STREET, HOUSTON 10, TEXAS • CHICAGO OFFICE AND FACTORY: 125 WEST 46TH STREET, CHICAGO, ILL. • SERVICE MEN AND WAREHOUSE STOCKS IN ALL PRINCIPAL CITIES

Who pays for the chips?

Hogging out unnecessary metal from flat bars to arrive at a complicated or irregularly shaped part is costly from every point of view. Collecting, grading and disposing of the chips is the least of it—far more important is what they represent . . . loss of man and machine-hours, wasted metal, power and cutting tools.

Through the design and production of Anaconda Extruded and Drawn Shapes, The American Brass Company endeavors to furnish the metal working industries with copper and copper alloys as near as possible to the size and shape of the finished product.

All of the Anaconda Shapes illustrated at the right were supplied in long mill lengths to leading manufacturers in widely diversified fields. The finished components—each a precision part made to close tolerances—are shown ready for assembly. Estimate the time, material and cost saving possibilities of such shapes in terms of your own product.

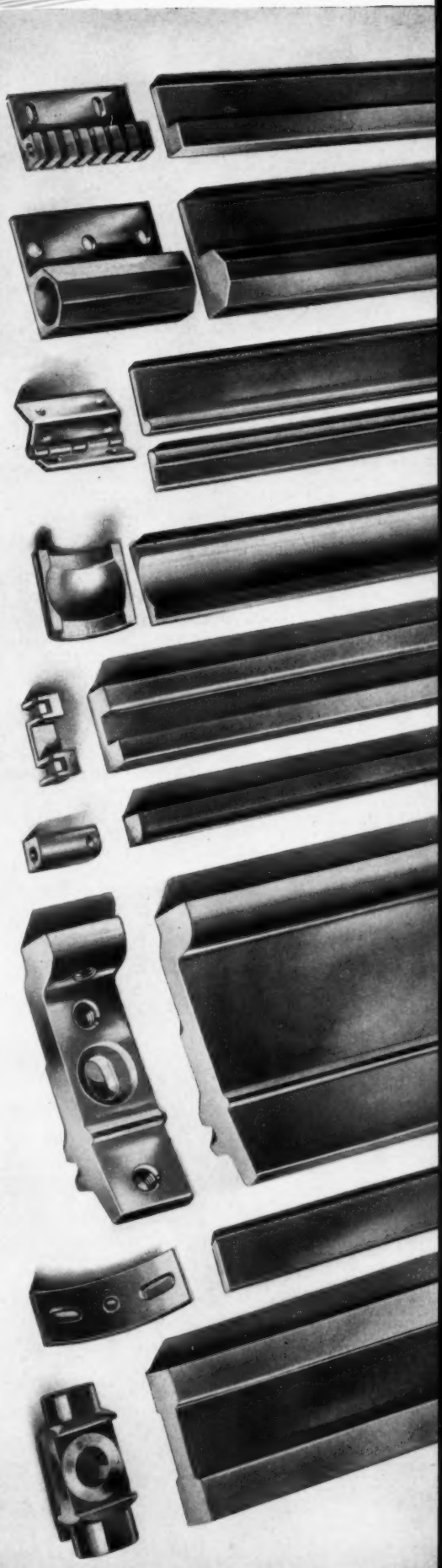
And remember that these are *wrought* shapes, produced by extruding, drawing or rolling to consistently accurate dimensions. They machine readily and are made of Anaconda Copper, Brass, Bronze and a wide range of Special Copper Alloys.

THE AMERICAN BRASS COMPANY

ANACONDA

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

Extruded & Drawn Shapes



screw machine products are born tattle-tales

A finished part drops into the pan every few seconds—and each one carries tell-tale evidence on the accuracy of the setup, the condition of the cutting tools and the machinability of the rod stock.

The machining characteristics of the rod are especially important on parts such as those illustrated—where threads must be full-formed and clean-cut, knurls well defined, with turned surfaces and reamed holes mirror-smooth.

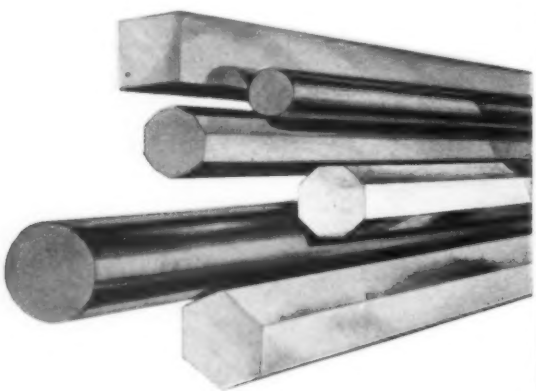
Many shops depend exclusively on Anaconda Free Cutting Brass Rods to meet such requirements day after day. These rods are consistently uniform in composition, temper and dimensions—mighty important qualities to those who make, buy, sell, or use screw machine products. 45156

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



The American Brass Company produces a large number of Copper and Copper Alloys in rod forms, and in all commercial sizes and shapes suitable for screw machine use. Their composition, properties and machinability ratings are listed in Anaconda Publication B-14. A copy will be mailed on request.

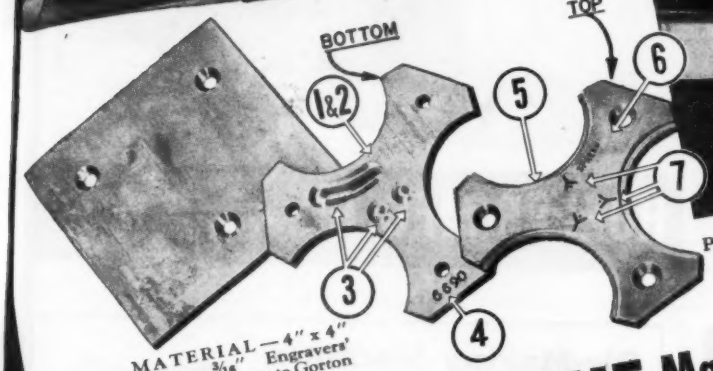
ANACONDA
from mine to consumer

Anaconda Free Cutting Rods

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



MATERIAL—4" x 4" square, 3/16" Brass, as it comes to Gorton Pantograph, with three holes drilled, countersunk.

PROFILING...SLOTTING...ENGRAVING, etc. *with Unskilled Operator*

Seven Operations on ONE Machine...from 1 Master

Showing VERSATILITY of GORTON PANTOGRAPH *Tracer-Control* . . .

ONE GORTON 3-Z PANTOGRAPH now performs work of several machines, eliminating various tools and fixtures formerly required—saving time and expense of separate machine set-ups and tooling.

SIMPLY BY CHANGING CUTTERS AND TRACING on both sides of a single, Flat Template (Master)—both top and bottom of this intricate part are completed within specified tolerances of ±.0025"—a total of 7 operations, in ⅓ previous time.

JOB IN BRIEF

PART—Indicator Plate.

7 OPERATIONS—(1) ROUGH MILL three arc sections...(2) FINISH-MILL sections...(3) MILL semi-circular groove and two 5/32" counter-bores...(4) ENGRAVE Part Number ...(5) Reverse Master and Part, PROFILE three U-shaped grooves along arc edges...(6) ENGRAVE word "SPREAD" and (7) ENGRAVE three Y-SLOTS to penetrate counter-bores.

CUTTERS—(only 4 needed)—Single Flute, straight-shank End Mills.

SPEEDS—Up to 9,200 r.p.m.

ENGINEERING SERVICE . . . FREE

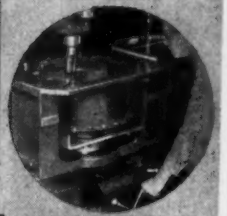
Find out how Gorton Tracer-Control Machines can pay for themselves in time and man-power savings like this in your shop...how they can perform multiple operations, freeing other machines for new work and increase production.

SUBMIT ANY PROBLEM—Send a sample part, prints, or specifications to your nearest Gorton dealer, or to the Gorton Factory at Racine, Wis. No obligation.

The *Right* Size The *Right* Type of Machine for Every Job...

From 2 oz. to 2 ton

DIE BLOCKS



Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY E NAVY

GORTON *Precision* MACHINES

TEAR OFF COUPON AND MAIL TODAY

George Gorton Machine Co.,
1504 Racine St., Racine, Wis.

Send me these free books

- ☐ Condensed Catalog
- ☐ Pantograph Engraving Machine

Name..... *Title*.....

Company.....

Address.....

City..... *State*.....

HOEFER *Designs* SPECIAL EQUIPMENT

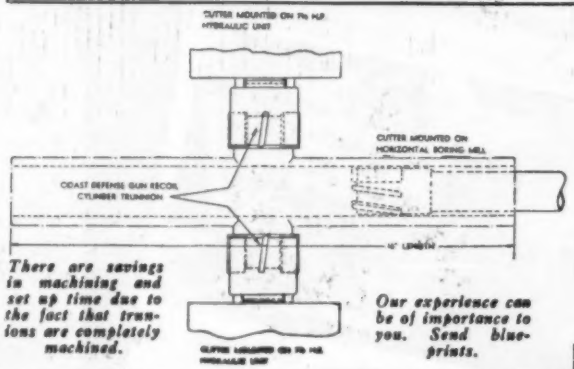
for machining a COAST DEFENSE GUN RECOIL MECHANISM CYLINDER with turning trunions . . . . . .

• This cylinder was mounted on the table of a large horizontal boring machine boring a 6-inch hole, 60 inches long. While the boring operation takes place there are two 7½ h. p. hydraulic units which turn and face the mean diameters of the true trunions.

The 7½ h. p. hydraulic units are equipped with special control valves to give rapid traverse forward—feed forward—dual return feed—return rapid traverse. Complete cycles in either direction.

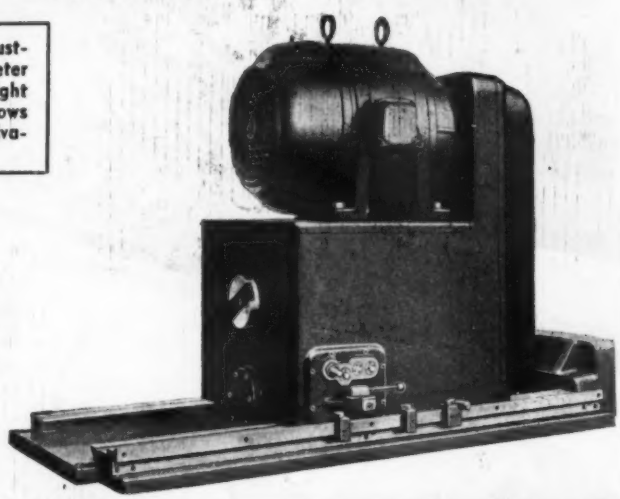
Control is provided so that hydraulic circuit can be disconnected and a feed screw on the machine base engaged. Two dials enable the unit to be moved mechanically either .010 or .001 per division on the dial.

7½ HP Unit for special purpose to cover a micrometer adjustment for a hand facing operation. When using the micrometer attachment, the ball lever shown on the gear box lower right corner, engages the screw which engagement automatically throws out the hydraulic circuit. In other words, each method of motivation is entirely independent of the other.



There are savings in machining and set up time due to the fact that trunions are completely machined.

Our experience can be of importance to you. Send blueprints.



Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

REID *for precision plus!*

SIMPLICITY
DURABILITY
CONSISTENCY
ECONOMY

REID SURFACE GRINDERS are of heavy, rigid *stress-proof construction* for smoother work finish.

Centralized controls assure ease of operation . . . simple, well balanced *design* for longer care-free duty. Whether for precision production work or tool room precision work REID GRINDERS are built to do the job *RIGHT*!---------- Send for catalog and price list today.

REID BROTHERS COMPANY, INCORPORATED
BEVERLY, MASSACHUSETTS

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co.,1414 Maumee St., Adrian, Mich.

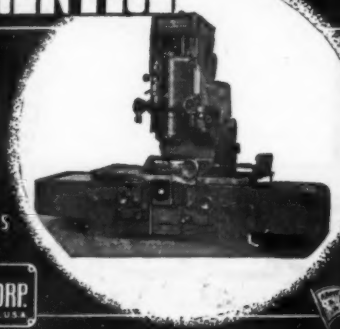
KNIGHT VERSATILE MILLERS ACCURATE-RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

REED-PRENTICE

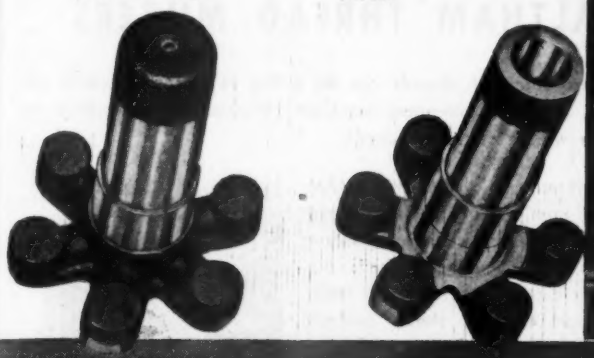
LATHES
JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS

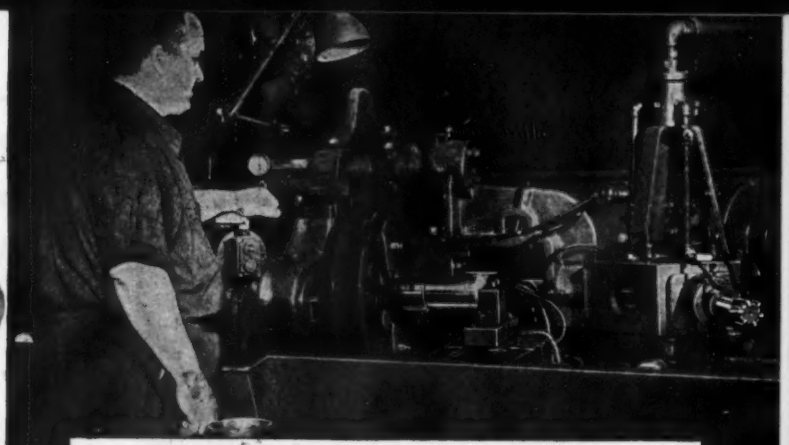


REED-PRENTICE CORP.
WORCESTER MASS. U.S.A.

Partially machined propeller shaft.

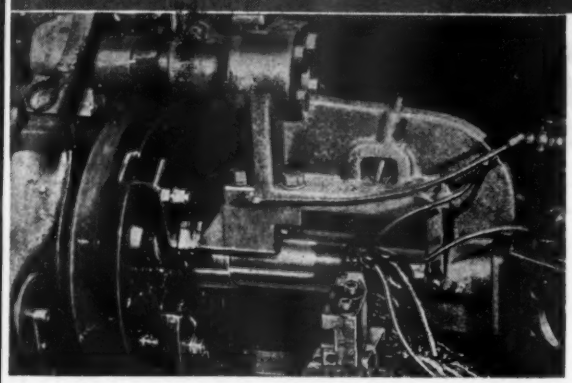
Finished turned shaft showing hole drilled and bored.





Foster 3F Fastermatic Turret Lathe showing special turning head with block type tool holder.

HOW MULTIPLE TOOLING COMBINES MACHINING CUTS *to Reduce Production Time*



Close up of special turning head showing tool block with multiple cutting tools in place for turning and undercutting operations.

Fastermatic Production Data

MACHINE—3F Fastermatic Turret Lathe.
PART—Propeller Shaft.
MATERIAL—AMS-6412 (Rockwell 38-46).
HOLDING METHOD—Special face plate fixture.
SPEEDS—Two positions 58 RPM, one position 17 RPM.
FEEDS—2nd Position—.0107" rough turn, face and drill.
4th Position—.030" finish turn, bore and counterbore.
6th Position—.020" ream.
ACTUAL MACHINING TIME—13 minutes, 24 seconds.

FREE Fastermatic Production Facts

Get your copy of this free catalog now. Learn how the Fastermatic Lathes will increase your production and solve difficult machining problems. Write Foster Division, 1100 Beardsley Avenue, Elkhart, Indiana.

Fastermatic Performs 10 Turning Operations on Propeller Shaft While Simultaneously Drilling and Boring a 2½" Diameter Hole

● Two special tool heads with block type tool holders perform 10 turning operations, which are completed while a 2½" diameter hole is being drilled and bored. All cuts are made on this aircraft propeller shaft in 10½ minutes. Operations include rough and finish turning two diameters, facing, counterboring and undercutting the shaft arms. At the same time a rough facing cut is made on the shaft end from the cross slide. After these operations are completed the 2½" diameter hole is reamed. Combining machining operations through the use of multiple cutting tools mounted on the Fastermatic turret and cross slide, it is possible to reduce production time to a minimum.

Less Machine "Down Time"--Longer Tool Life

● All machining operations required for the propeller shaft are carried on automatically. Two automatic speed changes and three feed changes are used which keeps the Fastermatic operating at its most efficient rate. Automatic feed and speed control results in longer tool life and less machine "down time." Production in your plant can be increased with resulting savings in time and tool cost by application of Fastermatic Automatic Turret Lathes to your chucking work. Foster engineers will be glad to make recommendations and suggest the proper machining methods and tools required. There is no obligation.

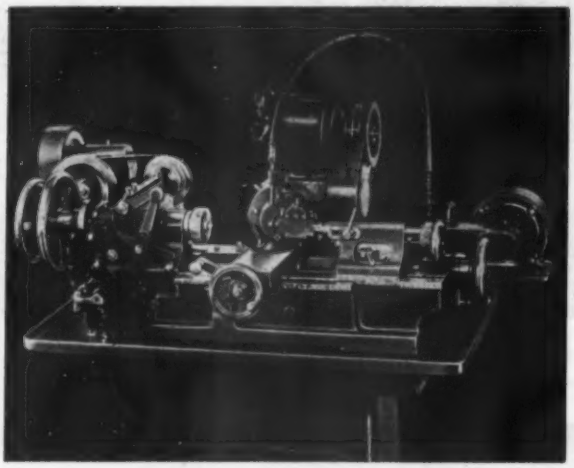
INTERNATIONAL MACHINE TOOLS

Foster Division - Elkhart, Indiana

INTERNATIONAL DETROLA CORPORATION

DETROIT, MICHIGAN • ELKHART, INDIANA • INDIANAPOLIS, INDIANA

FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOLS

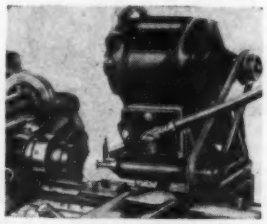


Fast, PRECISION THREADING *of* SMALL PARTS *Assured . . . by*

WALTHAM THREAD MILLERS

All standard forms of threads can be milled to closest precision on these fast, versatile, convenient machines. Waltham is in position to furnish the various cutters required.

Three motors are employed on WALTHAM machines, permitting individual speed changes for cutter and work and constant speed for pump. Available speeds are provided for cutting either brass or steel. A single start and stop station controls all motors.



Machine equipped with Internal Threading Attachment

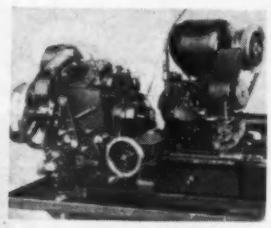
Specifications:

Swing over carriage—3"
Capacity—(dia. of work)—2" or smaller
Thread length (work on centers) —8¾"
Thread length (work chuck-held) —10"
Dia. hole through spring chuck—⅝"
Dia. hole through work spindle—¾"
Max. distance between centers—12"
Floor space—48" x 34"

Write for Bulletin 244A

EXTRA EQUIPMENT

Special equipment, extending the utility of WALTHAM THREAD MILLERS, includes attachment for relieving, taper, internal threading, multiple cutter threading, translating gears, metric lead screw, cam operation, special tailstock for multiple cutter work.



Machine equipped with Relieving Head

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.

GRAND RAPIDS
NO. 15 HAND FEED
SURFACE GRINDER

. . . a rugged machine for fine, accurate work

This high grade, motor driven machine will handle all work within its capacity with maximum convenience. Among the features which assure fine, accurate work and long precision service are the following:

. . . heavy, one-piece column and base
. . . precision ball bearing spindle
. . . careful guarding of wearing surfaces
. . . provision for wet grinding

This machine can be furnished with coolant system or dust collecting system.

Longitudinal Table Movement—19"
Transverse Table Movement—8½"
Vertical Movement—12"
Table—6"x18"

Send for illustrated literature giving further details.

GALLMEYER & LIVINGSTON CO.
330 Straight Street, Grand Rapids (4), Mich., U. S. A.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Hy-Draulic SHAPER-PLANERS

HAVE THE EXACT SPEEDS AND FEEDS YOU NEED FOR THAT WORK YOU WANT TO DO FAST.

Cutting speeds and feeds are quickly and infinitely adjustable, within specified limits, in Rockford Hy-Draulic Shaper-Planers. There's every convenience for quick set-up and easy operation. Cutting pressure is uniform throughout each chip thus working cutting tools to maximum capacity. Table returns "on the double" after a smooth shockless reverse.

Maintenance is simple and easy in the Rockford Hy-Draulic Shaper-Planer. Tool cost is very low. Easy operation saves time, manpower and horsepower. Because the drive is *hydraulic*, the Shaper-Planer table cannot slide off the bed and cause damage, and it can stall under cut without harm to cutting tool or machine.

There's a wide field of planing in which the Hy-Draulic Shaper-Planer is unbeatable for getting out accurate work fast. Write today for details.

Ask for Bulletin 1121.

4501

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

Victory Drive in Europe and Asia,

or Peacetime Competition at Home

They're Both in the Range of

LIPE Carbo-Matic

HYDRAULIC-CYCLE

LATHES

180 speed changes . . . cutting range 0.002" to 0.040". Swing over bed 16", between centers 30".

● Lipe Carbo-Matics were designed for war—for high-speed "hogging" cuts through tough armament steels. For more than 4 years, they've proved their ability to stand punishing 3-shift schedules without loss of precision, trueness or smoothness. Year in, year out, they've produced maximum pieces per day with minimum rejects.

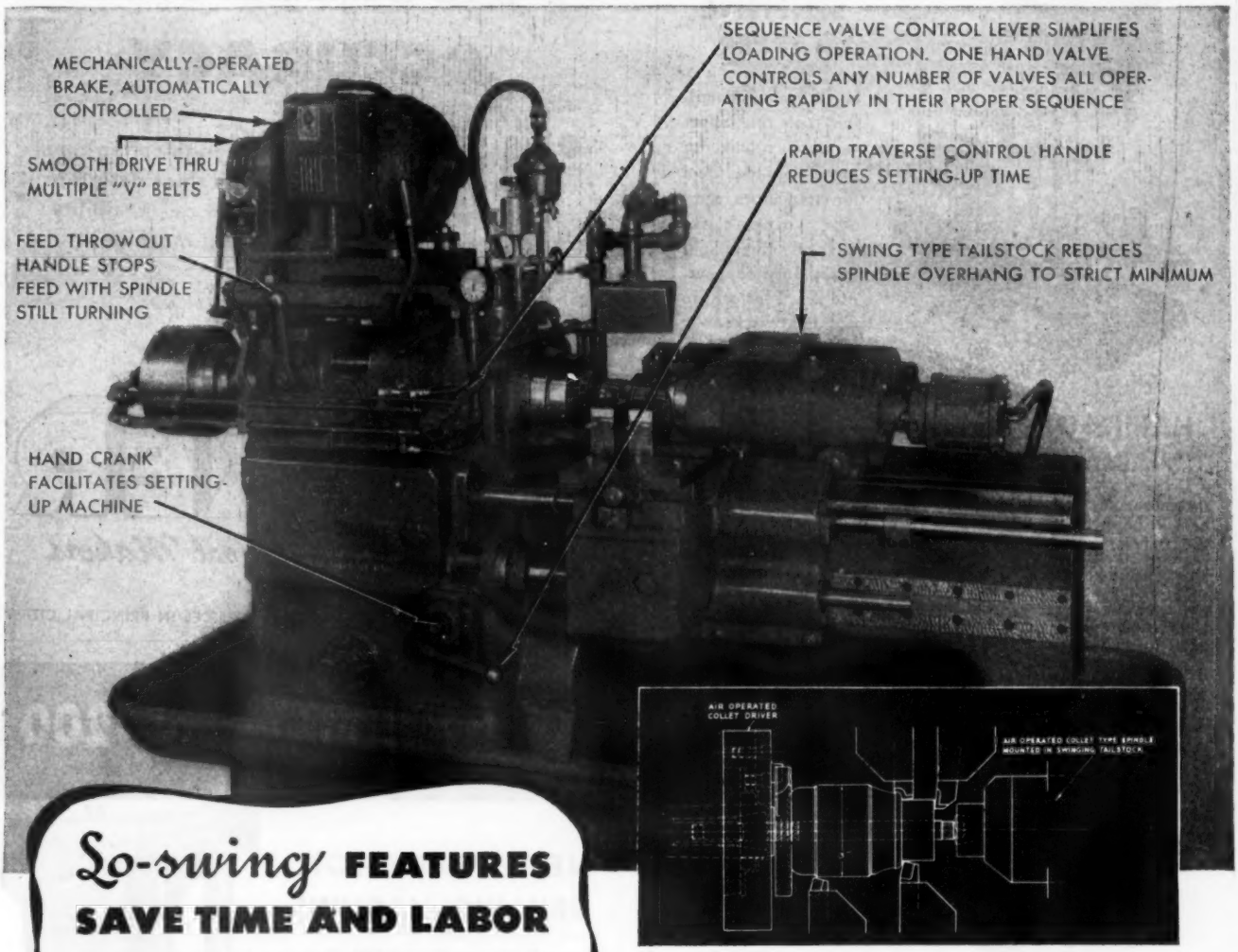
● But automatic operation . . . low labor costs . . . low cost per piece . . . were also engineered into these hydraulic-operated lathes. Their designers were engineers schooled in the economics of peace . . . men who are primarily competitive-minded. That's why Lipe Carbo-Matics are especially suited to the "battle of competitive survival" that will immediately follow VE-day. They will give you finer quality of product . . . in larger volume . . . and at lower cost.

● If you own Lipe Carbo-Matics use them to the hilt in the drive for final Victory. If you lack the speed, precision and economy which Lipe Carbo-Matics would bring you, plan now to re-equip with them before VE-day comes. Write now for delivery dates.

Lipe-Rollway CORPORATION, SYRACUSE 1, N. Y.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK


MECHANICALLY-OPERATED BRAKE, AUTOMATICALLY CONTROLLED
SMOOTH DRIVE THRU MULTIPLE "V" BELTS
FEED THROWOUT HANDLE STOPS FEED WITH SPINDLE STILL TURNING
HAND CRANK FACILITATES SETTING-UP MACHINE
SEQUENCE VALVE CONTROL LEVER SIMPLIFIES LOADING OPERATION. ONE HAND VALVE CONTROLS ANY NUMBER OF VALVES ALL OPERATING RAPIDLY IN THEIR PROPER SEQUENCE
RAPID TRAVERSE CONTROL HANDLE REDUCES SETTING-UP TIME
SWING TYPE TAILSTOCK REDUCES SPINDLE OVERHANG TO STRICT MINIMUM
AIR OPERATED COLLET DRIVER
AIR OPERATED COLLET TYPE SPINDLE MOUNTED IN SWINGING TAILSTOCK

Lo-swing FEATURES SAVE TIME AND LABOR ON COMMUTATOR JOB

Problem: **To provide an efficient and rapid method of automatically turning rotor and starter commutators.**

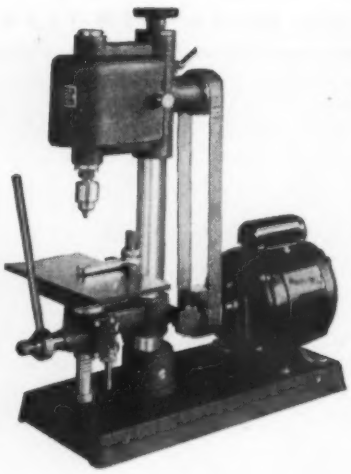
Solution: **The Model "LR" Lo-swing Lathe selected for this job incorporated the seven features listed in the illustration above, and was tooled as shown in the tooling layout.**

The swinging tailstock reduces spindle overhang and facilitates loading and unloading the machine. Considerable time is saved by the single lever which controls a sequence of operations, instead of the operator having to manipulate a number of separate levers. When the operator inserts a new piece and throws the single sequence control lever, the following operations take place: 1st, the tailstock swings back into operating position; 2nd, the tailstock spindle advances to support the piece; 3rd, the collet chuck closes. When the machine stops automatically at the end of its cycle, the operator again throws the lever to reverse this series of operations in proper sequence. A safety device prevents the machine from being started before the various movements are completed.

Standard Lo-swing design incorporates many features that increase production by reducing "down time" and "handling time". Seneca Falls engineers are at your disposal to assist in the development of time-saving devices for your particular jobs.

LATHE NEWS from SENECA FALLS

HAMILTON TOOLS BUILT FOR PRECISION WORK



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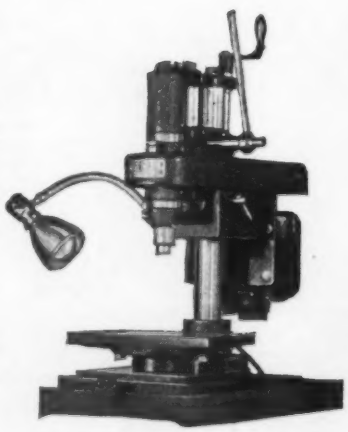
Instantaneous variable speed adjustment in two ranges.

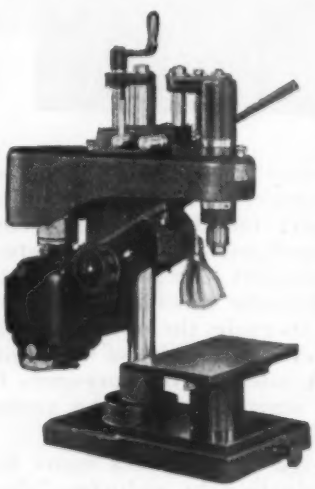
Low range 840 to 2700 r.p.m.

High range 2900 to 9300 r.p.m.

Drill capacity, .004" to 5/16".

Full floating spindle especially designed to eliminate belt pull on the spindle.





HAMILTON MAXI-JR-E

For drilling small holes from .004" to .250" diameter. Self contained drilling unit swings radially on the column and can be locked in any desired position. Can be ganged for sequence operations or to increase production. Possible spindle speeds from 750 to 8750 r.p.m.

Full floating spindle specially designed to eliminate radial belt pull on the spindle.

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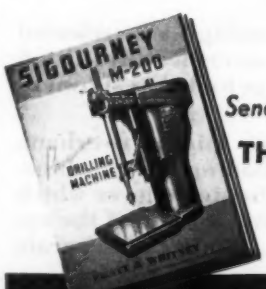

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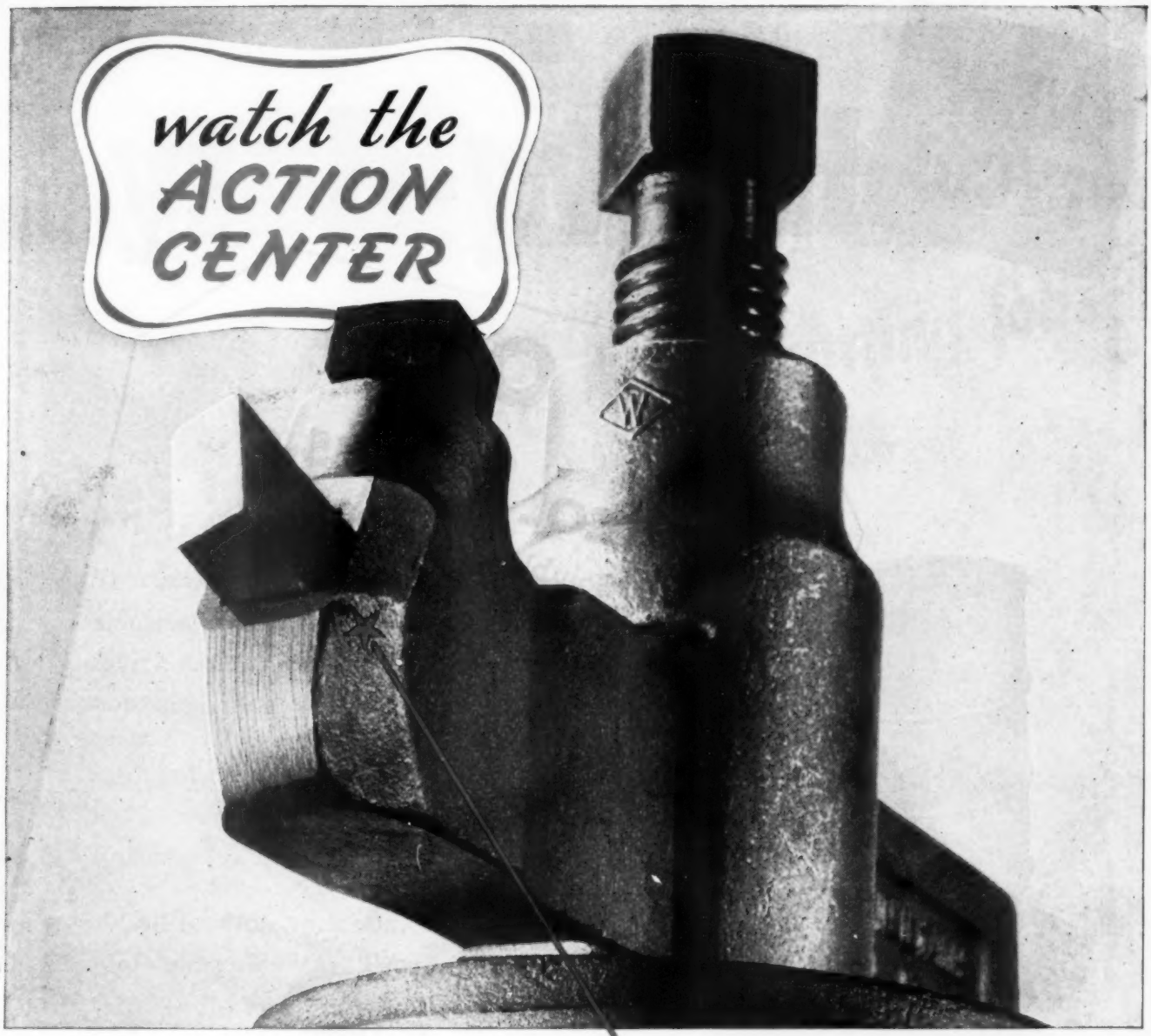

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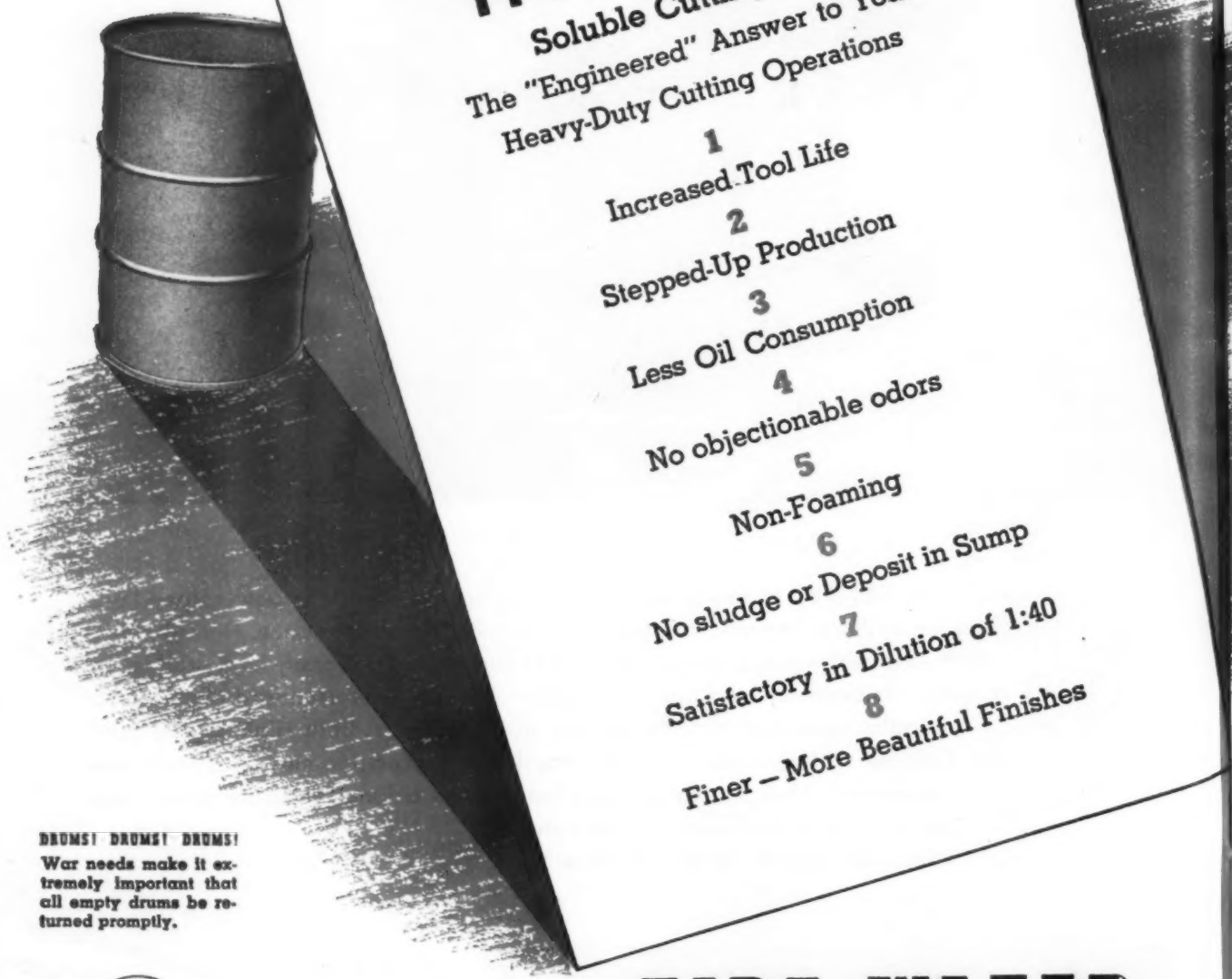

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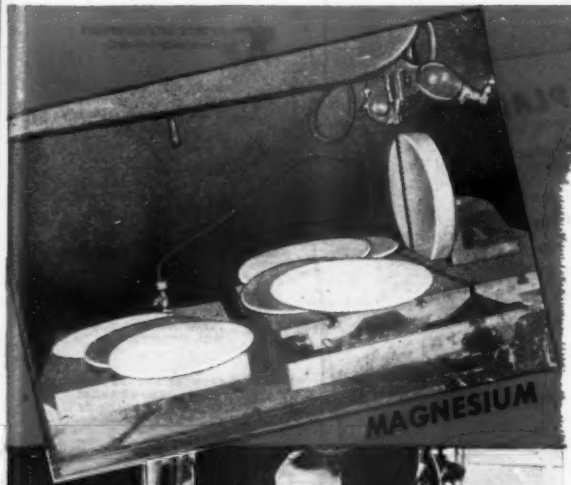

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The Buttress went right to work in plants making parts for planes, ships, P.T. boats, motors, jeeps, trucks, armaments, instruments.

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For bar stock up to 1½" in diameter
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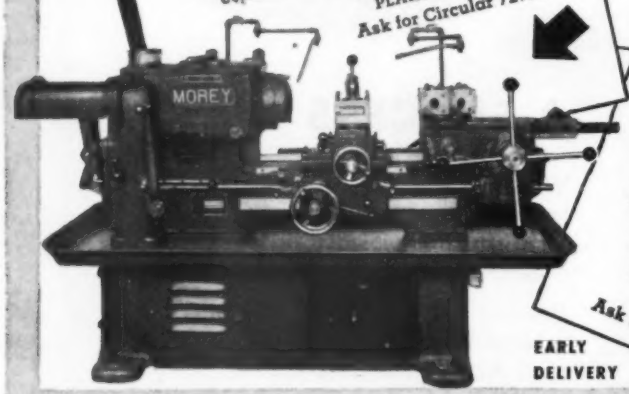

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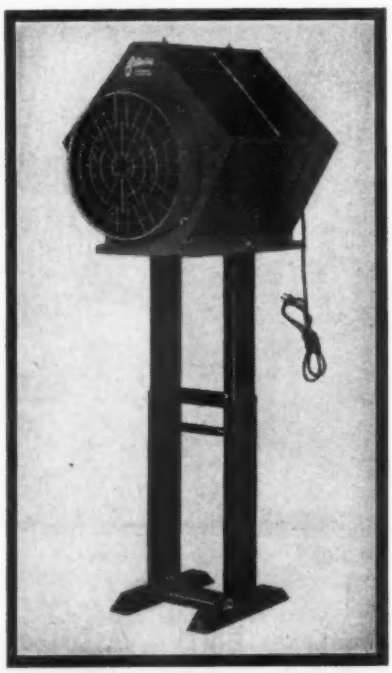
Plug in a Filtaire in any handy 110-volt outlet and it's ready to run.



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. . . for Precision Internal or External Threads . . . Right or Left Hand

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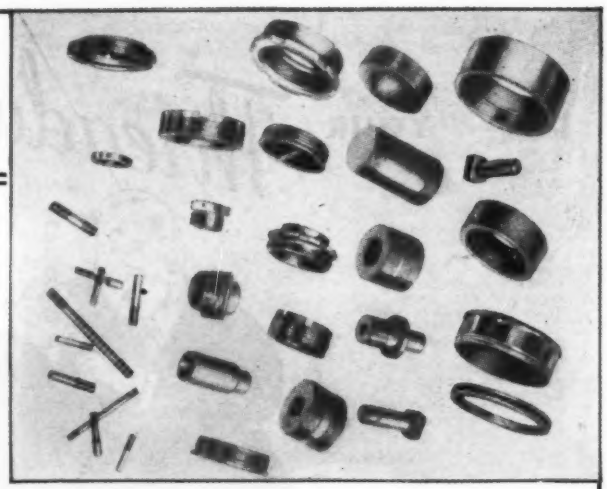

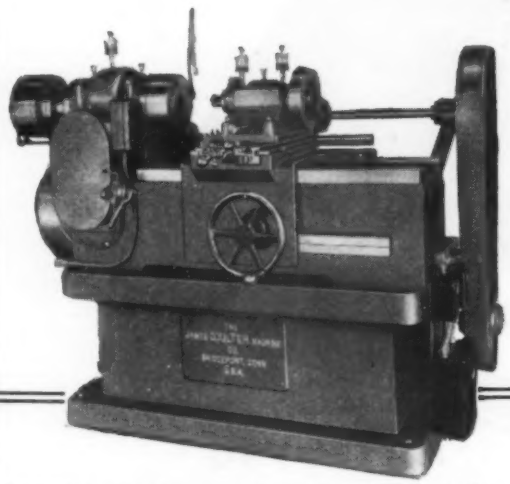

This modern machine can be depended on to produce and duplicate close tolerance threaded parts. With the exception of loading, all operations are fully automatic. Any parts that can be held in a Universal chuck, air-operated chuck or special fixture can be threaded, on the COULTER, internally or externally, either right or left hand.

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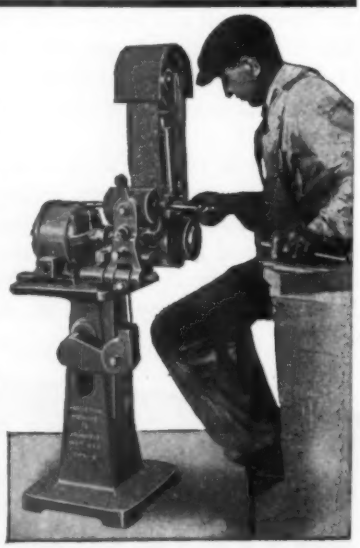

SPECIFICATIONS

Abrasive belt—4" wide, 60" long
Motor 1 H.P., 1750 R.P.M.
Belt speed—3200' per min.
Dist. table to floor (Horizontal position) 36"
Table—4½"x13½"
Ball Bearing equipped

Write for illustrated literature giving full details.

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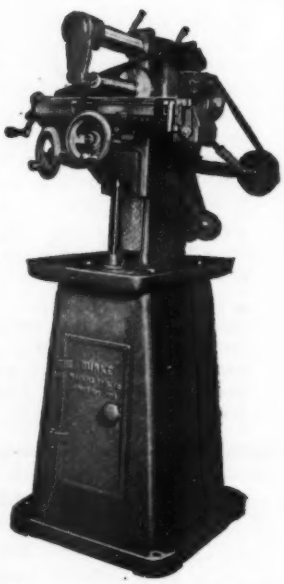

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

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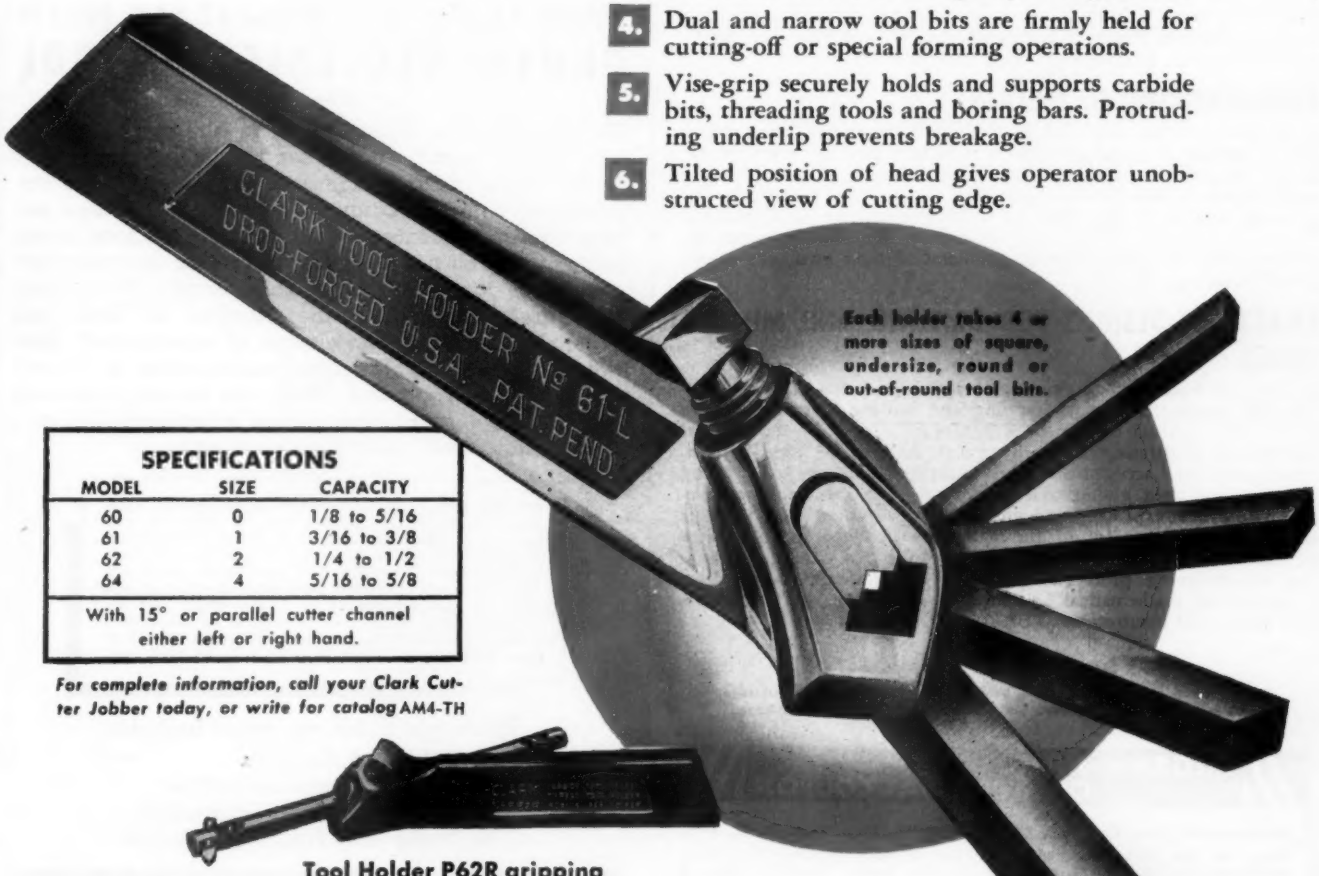
with all these features:

1. Exclusive vise-grip jaw exerts 4-sided pressure evenly over *full* length of cutter channel, prevents sagging under-channels and broken bits.
2. Bearing surface of the adjustable vise-grip jaw has twice the width and five times the length of the average tool holder, and takes 4 or more sizes of tool bits.
3. Vise-grip jaw clamps large heavy bits or short stub ends with the same rigidity as forged tools.
4. Dual and narrow tool bits are firmly held for cutting-off or special forming operations.
5. Vise-grip securely holds and supports carbide bits, threading tools and boring bars. Protruding underlip prevents breakage.
6. Tilted position of head gives operator unobstructed view of cutting edge.



Each holder takes 4 or more sizes of square, undersize, round or out-of-round tool bits.

SPECIFICATIONS

MODEL	SIZE	CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel either left or right hand.

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Tool Holder P62R gripping Clark Lever-Lock Boring Bar

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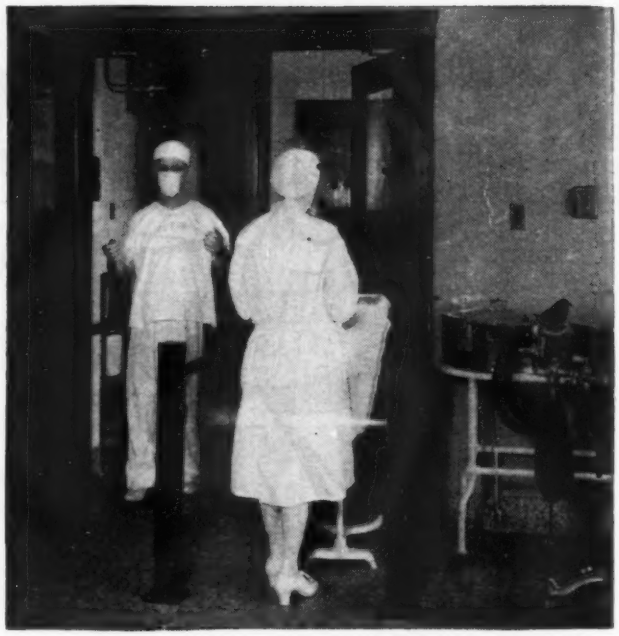

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HI-Q says:

"QUALITY contributes to Victory by GETTING OUT THE TOUGH BIG JOBS ...and F-A-S-T"

● It's a fact that almost any shop can do a pretty good job on the small work. But it's a different story when you get to the BIG STUFF.

That's where WE come in! From the very beginning, our reputation has been built on the success we had in tackling the "tough babies" ... jobs no one else cared to handle. We're still doing it, and whipping them, too.

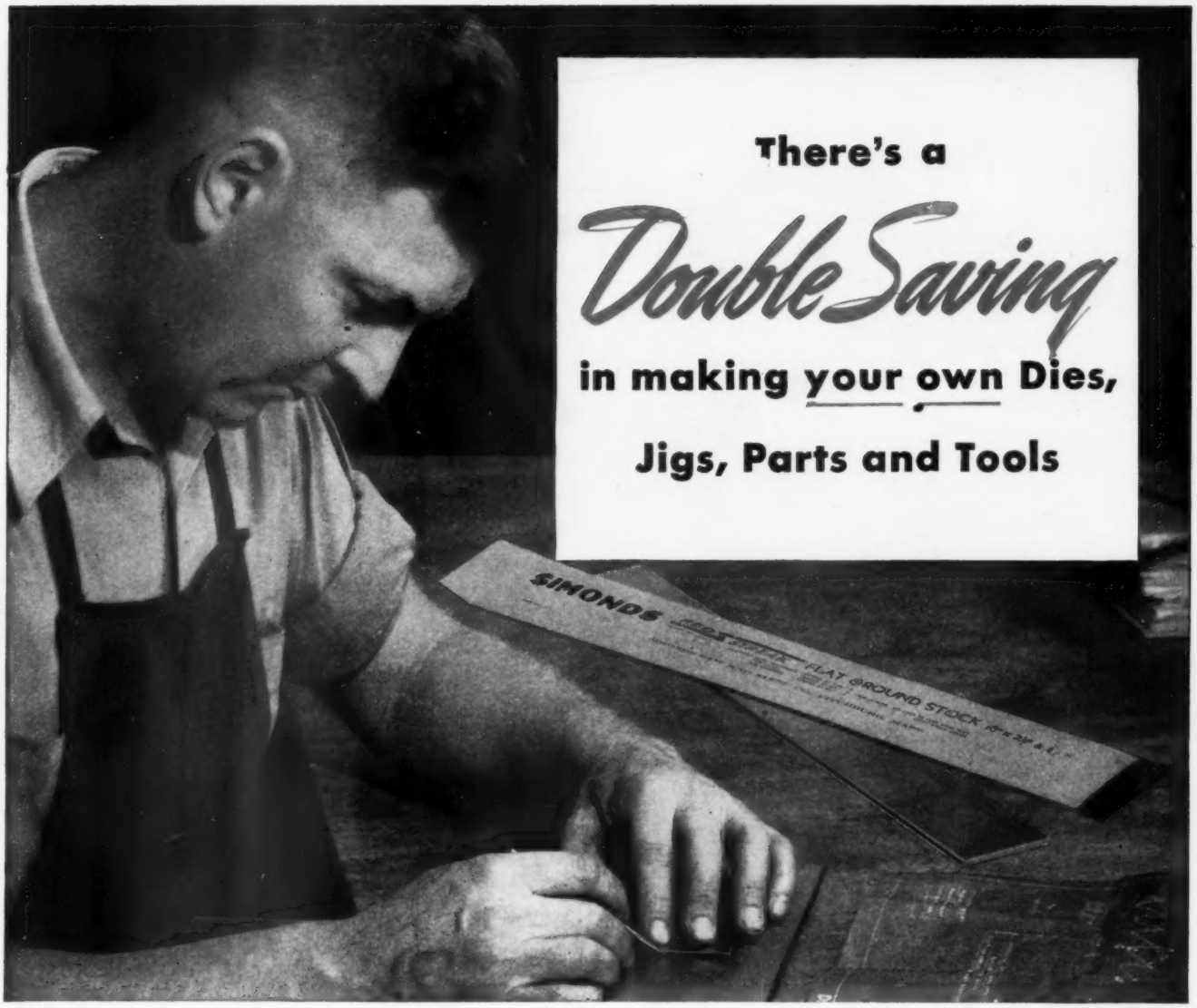
At present our shoulders are at the Victory wheel, turning out Cartridge Case Inspection Gages ... many of them BIG FELLOWS—like the ones in the picture above.

This is Quality's contribution to Victory.

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS 2, INDIANA



...with SIMONDS Flat Ground Stock

You save the time of waiting for hard-to-get gages and tools. And you save time again . . . because you don't have to grind Simonds Flat Ground Stock to size. It's cut to 18" length and *accurately ground* to standard thicknesses and widths. All edges and ends are mathematically square, and all surfaces are smooth to facilitate layout work.

This stock is Simonds' own special high-carbon tool steel, uniformly annealed for easy machining and proper oil-hardening. Each piece is packed in its own envelope, plainly marked with size and directions for heat-treatment. "Red-Streak" Flat Ground Stock is made in 121 sizes, with standard sizes usually available from your dealer.

Branch Offices: 1350 Columbia Rd., Boston 27, Mass. • 127 S. Green St., Chicago 7, Ill. • 228 First St., San Francisco 5, Calif. • 311 S. W. First Ave., Portland 4, Ore. • 31 W. Trent Ave., Spokane 8, Wash.

PRODUCTION TOOLS
FOR CUTTING METAL,
WOOD,
PAPER, PLASTICS

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS

CUT THE WAR SHORT... BUY WAR BONDS... AND THEN BUY MORE WAR BONDS

FORD
NORDEN
VICTOR
A NEW SERVICE by VINCO
MEMO..... from the desk of the Exec. Vice President
Att. Advertising Dept.
PRECISION PARTS ON A PRODUCTION BASIS
This is an important subject - mass production of precision parts is a serious problem in many plants - Stress fact that we produce precision parts on schedule in quantity, to exact specifications - Should interest Mechanical Industries greatly - Photo is ample proof that "Millionths of an inch for sale by VINCO" is a working slogan worth investigating.

MILLIONTHS OF AN INCH FOR SALE BY VINCO
REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

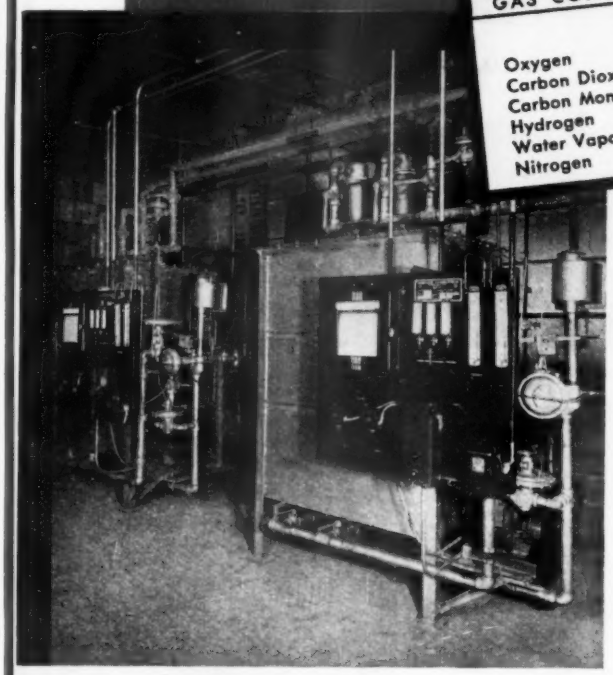
Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

Prepared Atmospheres *for:*

★ CARBURIZING AND RECARBURIZING
★ CLEAN AND BRIGHT HARDENING
★ BRIGHT NORMALIZING AND ANNEALING
★ SPECIFIC EFFECTS UPON METAL SURFACES

● The need for specific types of prepared atmosphere gases is indicated by the following data, giving the effects of various gases on ferrous materials:

GAS CONSTITUENT	REACTION		
	PURE IRON	IRON OXIDE	IRON CARBIDE
Oxygen	Oxidize	------	Oxidize-Decarburize
Carbon Dioxide	Oxidize	------	Oxidize-Decarburize
Carbon Monoxide	Carburize	Reduce	----------
Hydrogen	----------	Reduce	Decarburize
Water Vapor	Oxidize	------	Oxidize-Decarburize
Nitrogen	----------	------	----------



Two Surface RX Gas Generating Units supply prepared atmospheres for a battery of 16 radiant tube, pit-type furnaces used in gas carburizing of roller bearing parts.

● When controlled atmospheres are used the above reactions are also controlled and the result is a superior heat treatment for either ferrous or non-ferrous metals.

In the booklet, "The SC Primer of Prepared Atmospheres", a complete discussion of the effects of gases on metals, the composition, reaction, and application of DX, NX, RX, CG and Char-Mo Gases, and generating units are given. Copies are available upon request.

For many years Surface Combustion has specialized in the science of the chemistry of gases as it applies to heat treating. Recent developments have indicated both surface and physical effects of gases on metals, promising interesting advancements in post-war heat treating practices. Superfast gas quenching and dry pickling are examples. Surface Furnace Engineers will be glad to discuss possible applications with you.

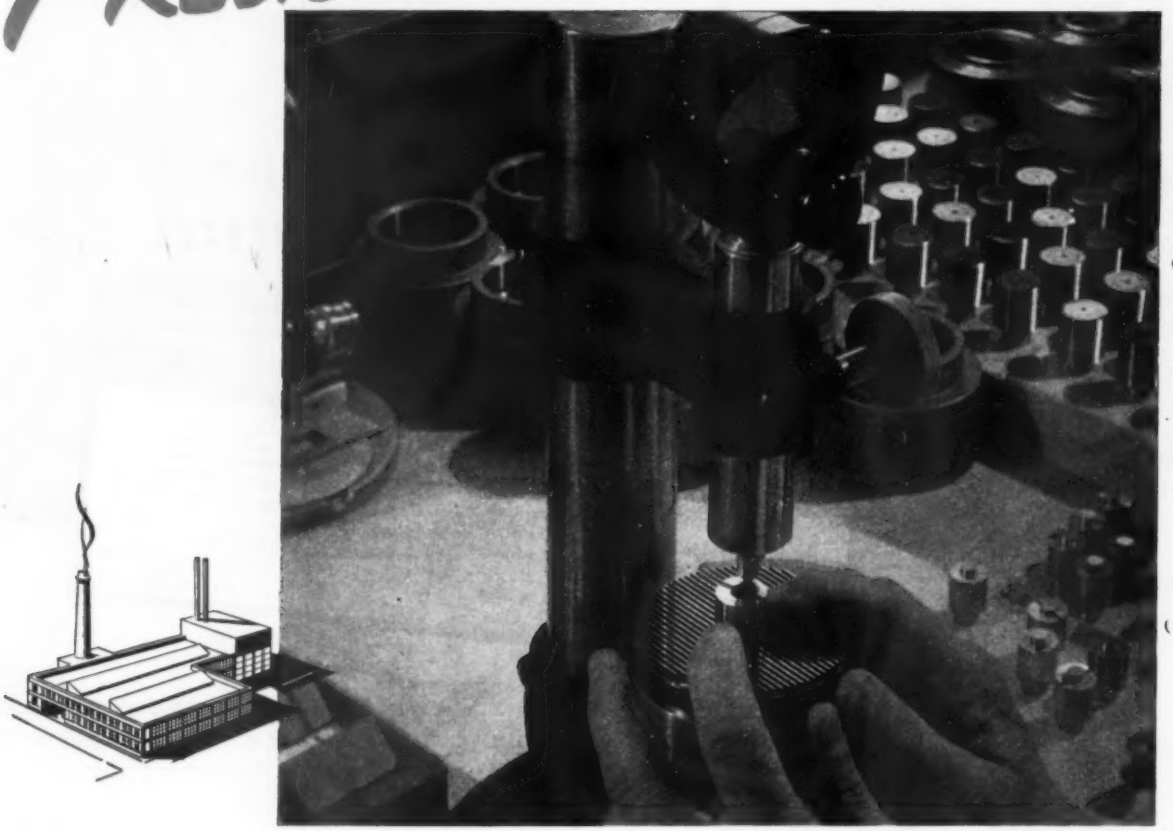
The Heat Treater's Helping Hand

Surface

SURFACE COMBUSTION • TOLEDO 1, OHIO

Standard and Special Industrial Furnace Equipment For:
Forging, Normalizing, Annealing, Hardening, Drawing, Carburizing, Nitriding and Heating. Special Atmosphere Generators. *Write for Bulletins.*

PRECISION is our business



◆The name of Kobe is synonymous with precision because precision is our business. In the production of Kobe Master and Reference Gages, every approach to improved manufacturing methods and processes is investigated and checked for practical application to Kobe production principles. Exhaustive laboratory analysis . . . the development of special machines and tools . . . master gaging by special instruments, some of them accurate to ten-millionths of an inch . . . constantly controlled conditions of temperature and humidity and highly trained technicians are all fundamental to Kobe operations.

Matchless production facilities, the result of accelerated and war-stimulated requirements, will be the basis for important new Kobe gaging refinements for American peacetime industry. Get the Kobe story before you buy any gage. It isn't too early to write and place your name on the Kobe mailing list now.

KOBE PRECISION GAGES—Kobe Master and Reference Gages are available in ring, plug and special types, most standard type gages being available from stock.

A few of the many types of Kobe Master and Reference Gages now being manufactured in quantity in Kobe's new controlled atmosphere plant.

KOBE

"ONE OF THE DRESSER INDUSTRIES"

Master and Reference GAGES

KOBE, INCORPORATED
3040 East Slauson Avenue • Huntington Park, California

HOW TO GET THE MOST PRACTICAL SOLUTION TO YOUR MILLING PRODUCTION REQUIREMENTS...

Whatever Your Milling Problem is, Sundstrand Engineers can Solve it Effectively... Using the Most Simple and Economical of these

three methods...

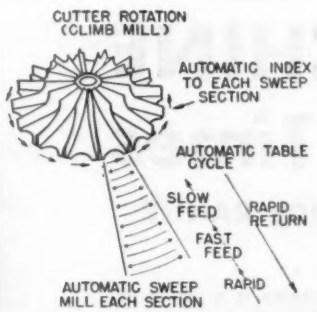
1 Standard Rigidmils with Fixtures and Tooling to Suit Your Work

Sweep Milling Between Impeller Vanes

Part—Supercharger impeller.

Operation—Sweep milling surfaces between vanes, and indexing from section to section.

Machine—Sundstrand Model 33 *Standard* Fluid-Screw Rigidmil provides complete automatic cycle for a highly complicated milling operation as follows: (1) *Automatic cycle* is standard machine feature. (2) *Automatic Index* is provided by a standard attachment. (3) *Automatic sweep cycle* is built into the special fixture.



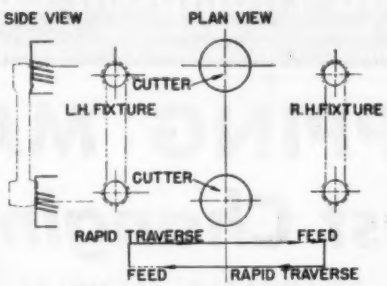
2 Standard Rigidmils with Special Heads and Tooling

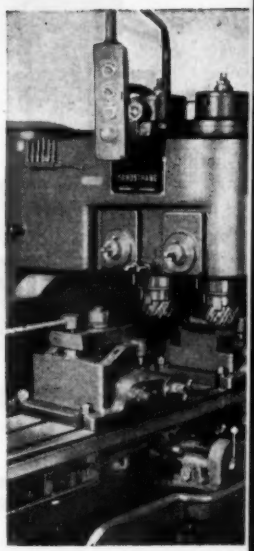
Face Milling Two Separated Surfaces

Part—Connecting rod.

Operation—Mill two surfaces simultaneously.

Machine—Sundstrand Model 33 *Standard* Fluid-Screw Rigidmil equipped with a *special 2-spindle vertical head* mills both faces. Standard two-way table cycle and two fixtures eliminate loading time.





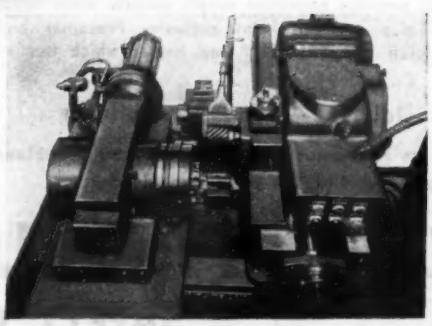
3 Entirely Special Milling Machines to Suit Specific Jobs

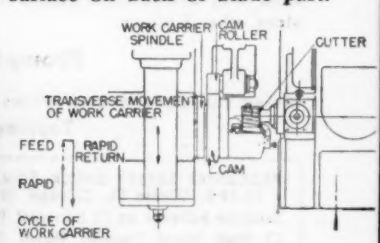
"Turn-over Mill" for Turbine Blades

Part—Stainless steel turbine blade.

Operation—Milling curved surface on back of blades.

Machine—*Special* Sundstrand Hydraulic Rigidmil has adjustable milling head and opposing work-holding spindle mounted on two sets of ways. Fixture feeds to correct depth, then revolves through approximately 265° to mill curved surface on back of blade part.





GET THESE *Free* BOOKLETS OR CALL IN A SUNDSTRAND PRODUCTION ENGINEER

These free booklets cover the entire range of standard Sundstrand Milling Machines. Write for them today —ask for Bulletins 126.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

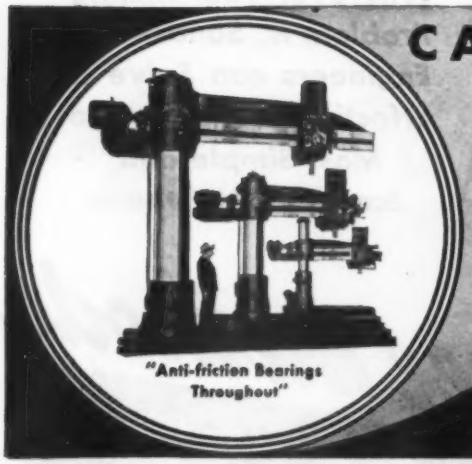
ARMY (E) NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

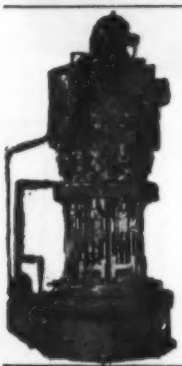
FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY



Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. Milwaukee 14, Wisconsin

Whoever thinks of hardness testing equipment thinks of the

"ROCKWELL" HARDNESS TESTER

Now and always made only by

WILSON

MECHANICAL INSTRUMENT CO. INC.

357 Concord Ave., New York 54

An Associate Company of American Chain & Cable

A TAPPING MACHINE *for Fast Changing Times*

IS FLEXIBLE, ADAPTABLE, HANDLES A WIDE RANGE OF JOBS

In these quick-changing times a truly UNIVERSAL low-cost tapping machine is a real asset. The Procunier unit here illustrated, by interchanging two tapping heads will handle from a No. 2 tap up to a 5/16" tap in steel, 3/8" in cast iron and 1/2" in brass and aluminum. That means that in your shops one Procunier can do the work of two or more machines.

In addition, all adjustments can be made quickly and easily—such as regulating compensating spring pressure, setting depth stop, changing to any of the four speeds from 390 to 2050 RPM, or adjusting timing or flow of tap lubricant. Extra long compensating springs assure uniform tapping and reversing pressure independent of operator. Tap establishes its own lead for greater accuracy. Automatic tap lubricator provides abundant supply exactly when needed. Motor-driven continuous flow lubricant pumps also available. Has exclusive Procunier high-speed tapping head with double-cone friction clutch and TRU-GRIP tap holder which has many advantages Many other features.

Prompt Delivery—Send for Bulletin

giving full details and prices on Procunier Universal Tapping Machines. High Speed Tapping Head and Tru-Grip Tap Holder.

PROCUNIER SAFETY CHUCK COMPANY
14-18 S. Clinton St., Chicago, Ill.
Send me bulletins on ☐ Universal Tapping Machines. ☐ High Speed Tapping Heads. ☐ Tru-Grip Tap Holders.
Name .....
Address .....
City .....
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PROCUNIER

SAFETY CHUCK COMPANY

14-18 S. Clinton St., Chicago, Ill.

NOW

SURFACE PLATES

and other precision equipment

AT 40% REDUCTION

Proportionate Reductions on Parallels, Angle Plates, V Blocks, Angle Irons and other Fine Precision Inspection Equipment

Now we announce a 40% reduction on our fine precision hand-scraped surface plates, with proportionate reductions on Angle Irons, Parallels, Straight Edges, V Blocks and other fine precision equipment.

These price reductions are made at no sacrifice in quality. Every Lombard surface plate will still have all the Lombard hall-marks of quality, scientifically heat-treated in our plant and precision hand-scraped.

Thousands of Lombard plates are now giving satisfactory use in leading aircraft and engine plants and in tool and die shops all over the United States. The surface plates you order at these new prices will be the equal of these plates in every respect. Back of every Lombard product stands a half century reputation for building fine precision machinery.

Write for catalog and prices indicating sizes in which you are interested. Prompt delivery.

Distributor Opportunities in Some Areas

LOMBARD GOVERNOR CORPORATION
ASHLAND, MASSACHUSETTS
BUILDERS OF PRECISION MACHINERY FOR 50 YEARS

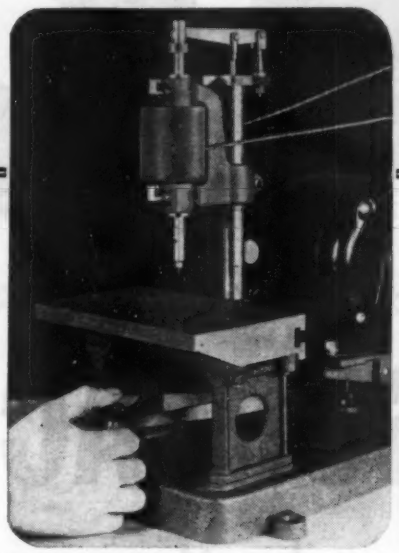
Plus values are assured with the combined air control action of the Marton Air Control Unit. This unit combines pressure regulator, gauge, control valve, lubricator and strainer in one neat, compact construction.

The use of the Marton Air Control Unit eliminates the extensive pipe fitting required of separate units and thereby reduces the cost of installation. It is easily adjusted, simply maintained and completely accurate!

For information write to—Marton Equipment, Inc., 505 Rantoul Street, Beverly, Massachusetts.

SMALLPEICE
MACHINE TOOLS and EQUIPMENT
Manufactured in U. S. A. and Great Britain

Speed—Accuracy—Facility for extremely small drills



THE LORD & DAVIS Super-Sensitive HIGH SPEED DRILL PRESS

The sensitivity of this precision machine—furnished in one, two, three or four spindles—is attained by balancing the spindle by means of the vertical component of the belt tension. Needle bearing construction of drilling head permits both axial and vertical motion of spindle, allowing spindle to float. The feel of the smallest drill is perfectly transmitted to operator's finger tip thus reducing drill breakage to a minimum even on heavy feeds.

Spindle speed 3000 to 23,000 R.P.M.—Drill capacity .004" to 1/16". Maximum feed—1¼". Table 4⅞" x 8".

Write for illustrated Bulletin, giving complete details

MASSASOIT MACHINE CO.
220 GROVE ST., WALTHAM 54, MASS.

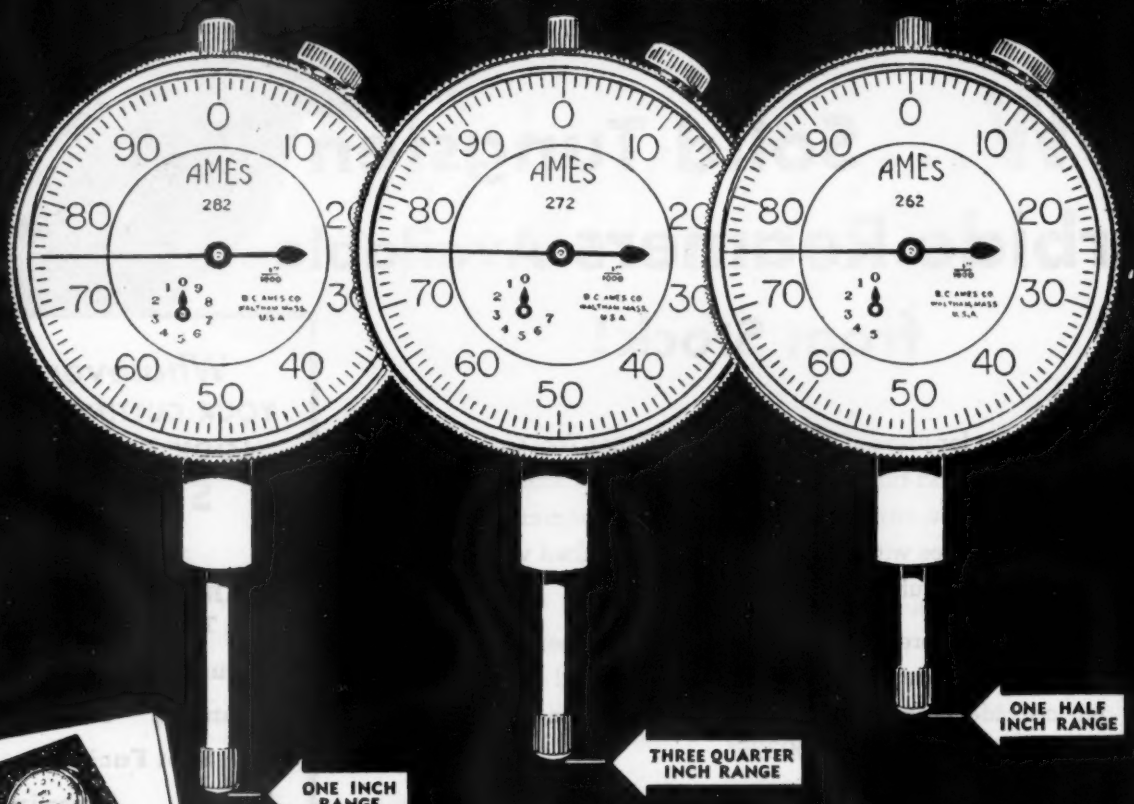
PORTAGE

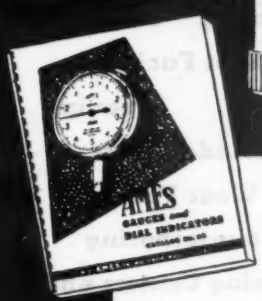
HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

AMES Long Range DIAL INDICATORS





These Ames Long Range Hundred Series Indicators are desirable when testing long tapers, in extensometer and geophysical work, or whenever greater range of spindle travel is required.

Graduated to .001", Range: .500"—.750"—1.000". Made in three Hundred Series Indicator sizes—in three dial graduations.

Long Range Indicators have double dials. Outer dial turns with bezel over inner stationary dial. Small hand indicates turns of large hand.

Write to-day for the new Ames Catalog No. 53.

B. C. AMES CO., WALTHAM, MASS., U. S. A.

BRANCH OFFICES: NEW CENTER BLDG., DETROIT 2, MICH., 420 LEXINGTON AVE., NEW YORK 11, N. Y.

CHECK ANOTHER SUPER "FIRST"

NOW... Solid Tungsten Carbide Reamers Available from Stock!

Good news for users of small reamers! Super Tool Company now stocks solid tungsten carbide reamers in sizes down to 125". Now you can order these small size reamers and get quick deliveries without the delays that resulted when they had to be manufactured on special order

And here is more good news! Because of Super Tool's advanced manufacturing techniques these small solid tungsten carbide reamers now can be furnished on special orders in sizes as small as .09375".

Next time you need small size reamers, specify SUPER . and get the better performance, the cleaner cuts, the precision work and the greater production economies that Tungsten Carbide can bring to your cutting jobs.

Write TODAY for complete data and prices on Super Standard Solid Tungsten Carbide Reamers.

Whatever
YOUR CUTTING JOB LOOK *FIRST* TO SUPER

★

CARBIDE TIPPED TOOLS FOR

Turning, Facing
Reaming Forming
Spot Facing
Boring Grooving
Grinder Rests
Wear Parts
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SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

Easy to use ... and so many places to use them

BETHLEHEM CARBON TOOL STEELS

Your tailor does not try to make one suit of clothes fit hundreds of different men. But in the case of carbon tool steel, the metallurgist is faced with the task of developing a single product for hundreds of different purposes—so that *your* job of selecting steel will be simplified.

Bethlehem carbon tool steels, with their tremendous range of applications, are the wheelhorses of the tool room. Here are a few of the characteristics that make these steels suitable for so many different tasks:

- ★ High, uniform hardness
- ★ Uniform grain structure
- ★ High abrasion-resistance
- ★ Excellent machineability
- ★ Simplicity of heat-treatment

Because of the high carbon content, special melting technique, and restrictions on incidental elements, Bethlehem carbon tool steels are produced under unusually rigid controls. They are not easy steels to make. But they *are* easy steels to use, as thousands of customers can testify.

When you purchase Bethlehem carbon tool steel in the X, XCL, or XX grade, you are buying a product that is generally regarded as the standard of the industry for hundreds of applications. To make sure that you are not overlooking some of its many uses, check with your nearest Bethlehem distributor.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
Bethlehem Steel Export Corporation, New York City

BETHLEHEM STEEL

X, XCL, XX ... *members of Bethlehem's BIG 8 Tool Steels*

FRICTION SAWING
• SHEET STEEL Formed or Flat
• NON-FERROUS METALS Formed or Flat
• ARMOR PLATE
• SOFT or HARDENED STEELS
• PLASTICS
• GLASS and Other Materials
By Arthur A. Schwartz
Chief Tool Research Engineer
Bell Aircraft Corporation
WRITE FOR FREE COPY OF THIS VALUABLE BOOKLET

Sensationally Fast, Safe and Widely Applicable..

this method is rapidly displacing other cutting methods. Learn all about it and the machines that make it possible —

Tannewitz HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Almond Drill Chuck

. . for over 70 years

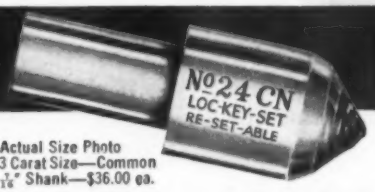
ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U.S.A.



Actual Size Photo
3 Carat Size—Common
1/16" Shank—$36.00 ea.

DIAMONDS *for Production*

RE-SET-ABLE • BIG-HED-NIB
(Trade Marks Registered)

LOC-KEY-SET
by Patented Process
U. S. Pat. 2,351,741

16
Factory Branches
Jobbers
Everywhere

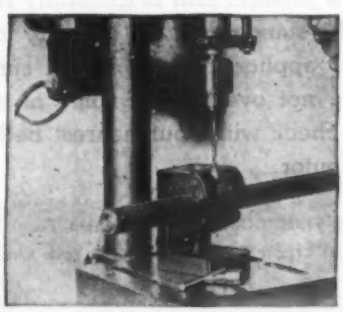
- **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.

No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of 1/8 carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend No. 60-CN.

Equip Now with "RE-SET-ABLE" Diamond Tools on Your Precision Grinding Production Line

DIAMOND TOOL COMPANY, Not Inc. SHELDON M. BOOTH, Pres. 938 E. 41st Street CHICAGO 15, Ill.



2" Capacity, 4⅛" x 3¼" x 3¼". Alloy Iron Casting. Furnished with ⅛" Drill bushing. Layout scale engraved on body above "V".

HANDY AS A POCKET IN YOUR SHIRT NECESSARY AS YOUR DRILL PRESS

Universal Center Drill and Mill Vise gives absolute cross center drilling. The Vise which is precision ground serves as toolmaker's work holder for precision drilling, and 90° layout drilling without removal of work from vise. It is adaptable for drill jig on small runs and can be used with hand drill, assuring true and accurate holes.

Distributed by your local dealer:

UNIVERSAL ENGINEERING CO.
2230 NATIONAL AVENUE **SAN DIEGO 2, CALIFORNIA**

"WALKERS" at Work

One of a series of advertisements showing the specific machines on which Walker Magnetic Chucks are used and the operations being performed.

10" x 24" Landis Type CH Universal Grinder, showing close-up of face grinding operation on rack gear cutter with work held by Walker Magnetic Chuck—wheel base swiveled 5°.

Where there's PRECISION, there's a WALKER CHUCK

Our engineers will help you solve your problems for standard or special applications. Let us show you how you can reduce your costs by the use of Walker Magnetic holding devices.

The job shown calls for high precision, which in turn means accurate, secure holding of the work. Universal recognition and acceptance of Walker Magnetic Chucks as outstanding holding devices wherever precision is required make Walker equipment the logical choice wherever work must be held to closest tolerances.

As pioneers in the design and development of Magnetic Chucks, Walker has constantly improved and extended its line to include sizes and types to meet practically any requirement. Recent additions to the Walker line include:

. . . a New All-Purpose Longitudinal Pole Chuck with fine pole divisions—greater in stamina and absolutely waterproof

. . . a new line of Permanent Magnetic Chucks in Plain and Swivel Types which assure permanently greater holding power

. . . a New All Purpose Bar Pole Electro-Magnetic Chuck with fine pole divisions that withstands abuse and is waterproof.

O. S. WALKER CO., INC.

Worcester, Mass.

C-F POSITIONERS

6 sizes, capacities to 30,000 lbs.
Manual or Push Button Control

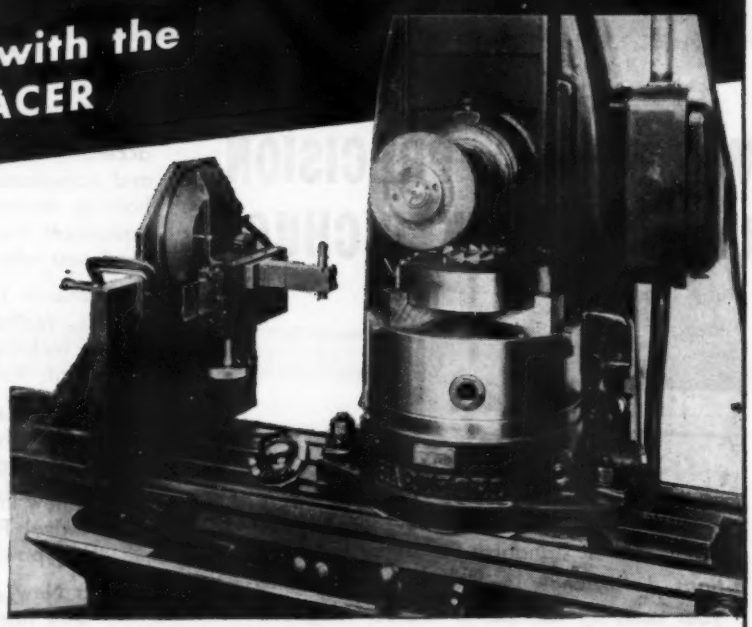
The extra strength built into C-F Positioners enables them to withstand the extreme side thrusts and torsional strains met in positioning cumbersome or unbalanced loads — Coupled with the C-F *pedestal-mounting* and adjustable height features, this extra strength increases the range of work handled, makes each C-F Positioner the most versatile tool in its capacity. You can do more work with C-F Positioners.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1313 S. Kilbourn Ave. Chicago 23, U. S. A.

Grind and Index.... fast and accurately....with the HARTFORD SUPER-SPACER



This set-up of the Hartford Super-Spacer for a grinding operation, provides extremely rapid indexing. After the teeth in the part, an aircraft clutch, have been roughed and hardened, this operation with the Super-Spacer grinds the clutching surfaces to a close radial tolerance. Note the fact that there are no guards to protect the Super-Spacer against dry dust, because the Super-Spacer is effectively sealed against dust and dirt, making such protection unnecessary.

Grinding is but one of many operations where the Super-Spacer is proving a profitable solution to tool room and production problems. Milling, drilling, planing, slotting and jig-boring are being speeded up and accurate indexing maintained through the use of this modern spacing device. The Hartford Super Spacer merits your most careful and prompt investigation.

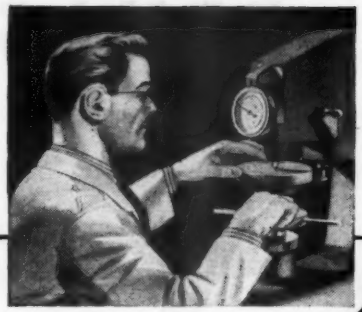
Write us today for further details.

The **HARTFORD**
SPECIAL MACHINERY COMPANY
HARTFORD 5, CONN

How consistent testing saves you trouble

BY subjecting every product to a series of tests before it leaves its factory, "CARBORUNDUM" saves industry an untold amount of grief. Uniformity of the abrasive means uniform wheel performance. Absence of flaws reduces down time in your shop. And these checks assure you that each product by "CARBORUNDUM" is the type of dependable abrasive tool you need for your job.

But there is still more involved in the production of good grinding wheels, coated abrasives and special products. It is equally important to get the particular abrasive combination best suited to the job. Your "CARBORUNDUM" Representative is the man to help you do that. And his efforts are supplemented by the knowledge of the "CARBORUNDUM" Abrasive Engineers. These are the men who have helped perfect a large share of the abrasive processes which have become standard. The Carborundum Company, Niagara Falls, New York.



THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

YESTERDAY'S PIONEER . . . TODAY'S LEADER

DOUBLE SERVICE ..FOR LESS COST

WELDON Double-End End Mills give you double the service for far less than the cost of two single-end end mills of equal size. Originated by WELDON the Double-End End Mill saves production time, too, because you simply turn it end for end when you want to change the mill.

Because they permit higher speeds and faster feeds with longer tool life, Double-End End Mills insure economy with increased efficiency on your every day production.

Write for Catalog 8-B

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

IMMEDIATE DELIVERY

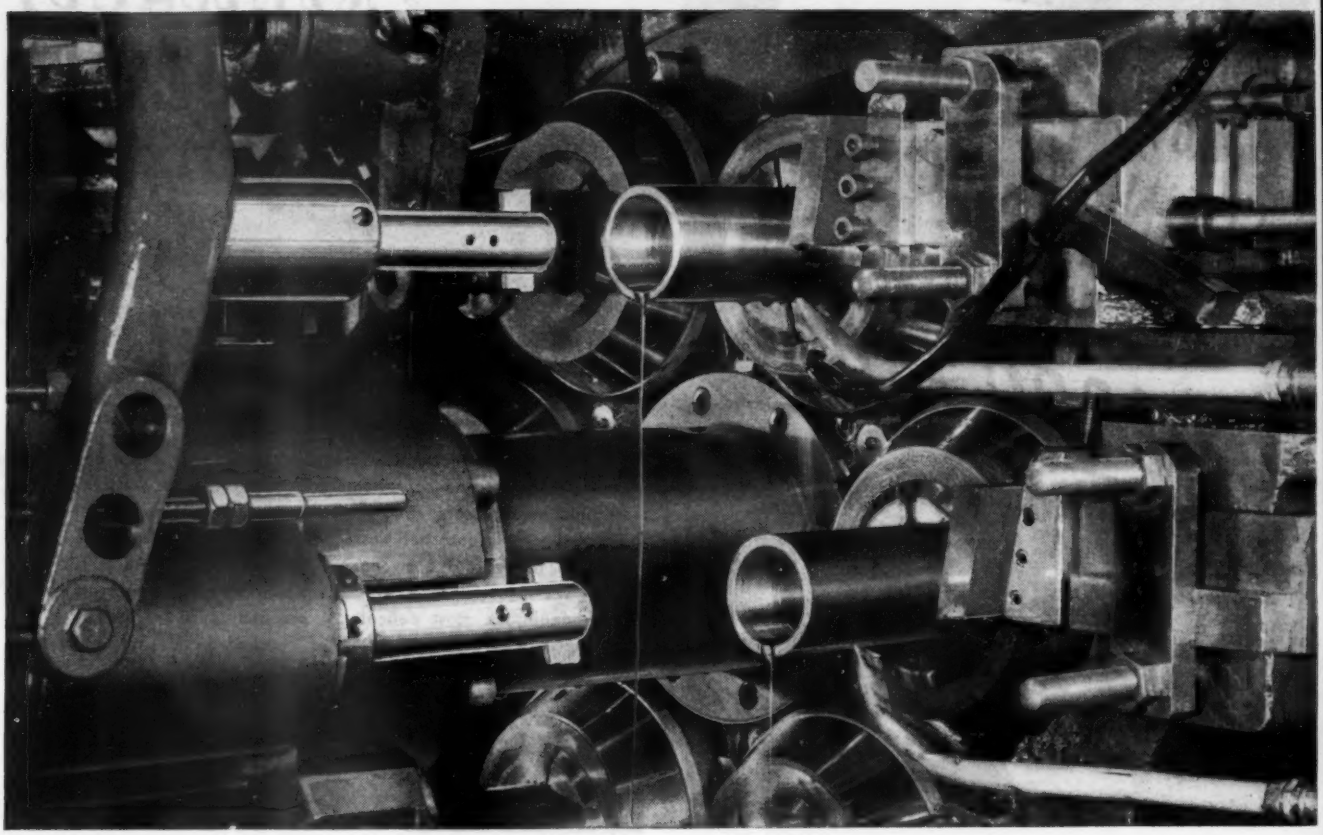
No. 1 to 60
New High Speed
Long Length

DRILLS

No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
51 to 60	4¼	.75

If you buy 60 drills or more — 20% discount

VICTOR
MACHINERY EXCHANGE
INC.
251 CENTER STREET
NEW YORK N. Y.



QUICK CUTTER CHANGE . . . CUTS HOLE COSTS

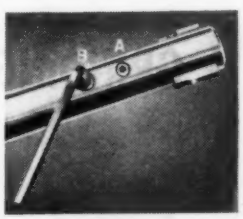
Because Madison cutters can be pre-sized they are easily interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. This effects more economical reaming operations in many ways. First, because cutter changing with Madisons is so swift and simple, you can keep a sharp cutter in operation at all times. This assures more continuously uniform work, and closer tolerances held, at higher speeds. Danger of overheating is practically nil. This helps eliminate the possibility of damage to the tool or the work.

Tool maintenance is decreased, as well. Forcing a dull cutter into the work generally results in damage. Chipped or burned out edges call for increased grinding and waste of cutter stock. A cutter changed at the proper time, however, needs only a light dressing up of the cutting edges. Don't forget, too, that sharp cutters assure a better reaming operation in metals that are not uniform. Sharp tools, as well, operate more efficiently in the hands of "green" help.

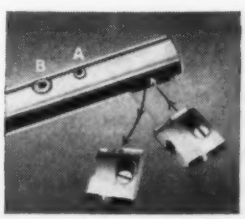
Add the advantages found in the quick cutter change feature to the other Madison features of one-screw adjustment and controlled float, and you have the reasons why Madisons help you lower final costs by reducing reaming time on every hole.

To better solve your reaming problems, write for the new Madison catalog . . . shows complete lines, prices and grinding instructions.

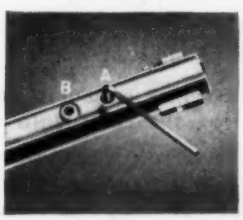
IT TAKES ONLY SECONDS TO CHANGE A MADISON CUTTER



Loosen lockscrew "a" and adjusting screw "b". Cutter can now be slipped from bar.



New cutter immediately is inserted in its place and float of cutter set by "b".



Tighten lockscrew "a" and work is ready to be resumed with sharp cutter.

MADISON MFG. CO. MADISON ADJUSTABLE REAMING TOOLS **Dept. A-1 MUSKEGON, MICH.**

How a 40-dollar ELGIN Sapphire Gage saved Stewart-Warner $4,000 PLUS!

Still showing less than .00001 inch wear, well within tolerance limits, an Elgin Sapphire Plug Gage has delivered the incredible total of 158,220 close tolerances gagings! Hi-speed *steel* gages, formerly used, wore beyond tolerance use after only 300 gagings! The startling contrast in *gage* cost for 158,220 gagings is shown below:

Gage	Gages required	Cost	Total Cost
Steel	527	$8.00 ea.	$4,216.00
Elgin	1	40.00 ea.	40.00
		SAVINGS—	$4,176.00

This tremendous saving is only for *one* of many gages on this job at Stewart-Warner—many Elgin Sapphire Gages are in continuous use at the plant.

The dimensional fidelity of Elgin Gages saves money, too, by *eliminating* worn-gage rejects. Chemically inert at normal temperatures, their contact points of sapphire do not rust, corrode, burr or become distorted with use.

Write for prices and information on Elgin Sapphire Plug and Ring Gages.

ELGIN SAPPHIRE PRODUCTS PRESENT MANY ADVANTAGES FOR THE FOLLOWING TYPES OF EQUIPMENT:

Gages • Bearings • Thread Guides • Extrusion Dies • Knife Edges • Spray Nozzles • Diesel Injector Nozzles • Soft Wire Dies • Burnishing Tools • Pressure Vessel Windows • Watch Crystals • Honing Stones.

America's best equipped sapphire fabricator

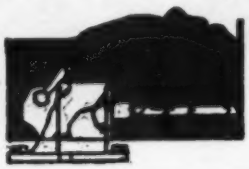
ELGIN NATIONAL WATCH COMPANY

Sapphire Products Division

932 Benton Street, Aurora, Illinois, U. S. A.

Announcing **MEAD AIR COLLET FIXTURES**

These new high production precision fixtures open up new vistas in the field of second operation work. Their accuracy will meet the most rigid requirements; their fast action leaves nothing to be desired; their compactness does not waste a fractional inch. They will hold a 1" bar so firmly that a strong man cannot turn it with a 12" pipe wrench, yet in conjunction with a suitable pressure reducer they will gently handle the most delicate of precision parts as low as 1/16" in diameter. Automatic ejection of finished work. *Write for new Mead Air Power Catalog.*



MEAD SPECIALTIES COMPANY

4114 NORTH KNOX AVENUE

Dept. MA-445 • CHICAGO 41, ILL.

CRAFTS

CARBIDE TIPPED GAGES AND TOOLS

Consistent Quality

ARTHUR A. CRAFTS COMPANY, INC.

603 Newbury Street at Kenmore Sq. BOSTON

DETROIT • CHICAGO

GRINDING WHEEL DRESSER

Desmond Cutter

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.

URBANA, OHIO

Canadian D-S Mfg. Co., Hamilton, Ont.

ARMY E NAVY

Integral Drive

PRECISION BENCH LATHE

A new stream-liner incorporating all the old Stark accuracy and stamina

THE first tool of its class with built-in Motor and speed changing mechanism (patented). Marvelously compact; nothing under the bench; no special bench or cabinet needed; even bolting down unnecessary:

Simply moving control lever to right engages the clutch, vertical position releases; moving to the left instantly brakes the moving spindle.

Standard (tool room) Model has time-tried double taper spindle bearings 156 to 2200 r.p.m.—the best for sustained accuracy.

High speed (manufacturing) Model fitted with finest precision pre-loaded anti-friction bearings, 200 to 3500 r.p.m.

Open Cone Lathes
in ¼", ½", ¾" & 1" sizes

Stark Motor Drive Unit
Smooth and Reliable

Precision Bench Millers
with best Indexing

Precision Attachments
Collets & Fine Tools

Both have 40 inch bed, 9 inch swing, 20 inches between centers; either ¾ or 1 inch collet capacity. Take regular STARK Attachments collets and chucks. This Stark (patented) built-in drive, integral with the Lathe itself, employs ½ h.p. geared ball-bearing motor drive through a disc clutch, and through V belts to the headstock, giving any split speed at the turn of the small hand wheel in front of operator.

Write for full information

STARK TOOL COMPANY

WALTHAM, MASS., U. S. A.

ESTABLISHED 1862

ORIGINATORS OF THE AMERICAN BENCH LATHE

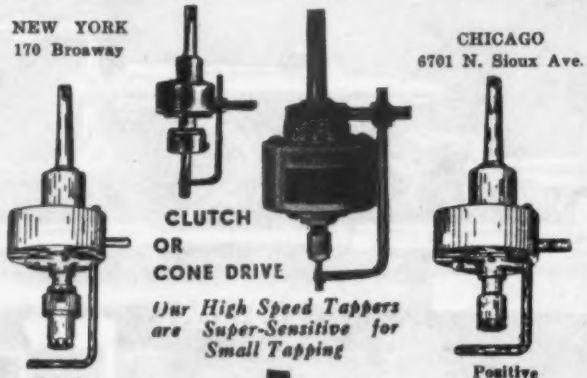
ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broaway

CHICAGO
6701 N. Sioux Ave.



CLUTCH
OR
CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Friction
No. O O C. S.

Positive
No. O O H. S.

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required. **Also, Opening Die-Heads; Opening Stud-Setters: Friction Screw-Drivers and Nut-Setters, etc.**

THE NEW QUADRILL

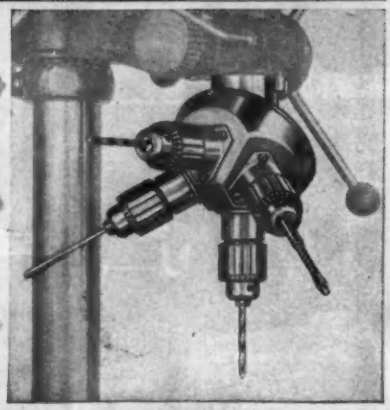
TURRET ATTACHMENT FOR DRILL PRESSES

RIGID ALIGNMENT STRICTLY ACCURATE

EASILY ATTACHES TO QUILL OF PRESS

QUICK INDEXING

FINGER-TIP CONTROL CHANGES DRILL POSITIONS



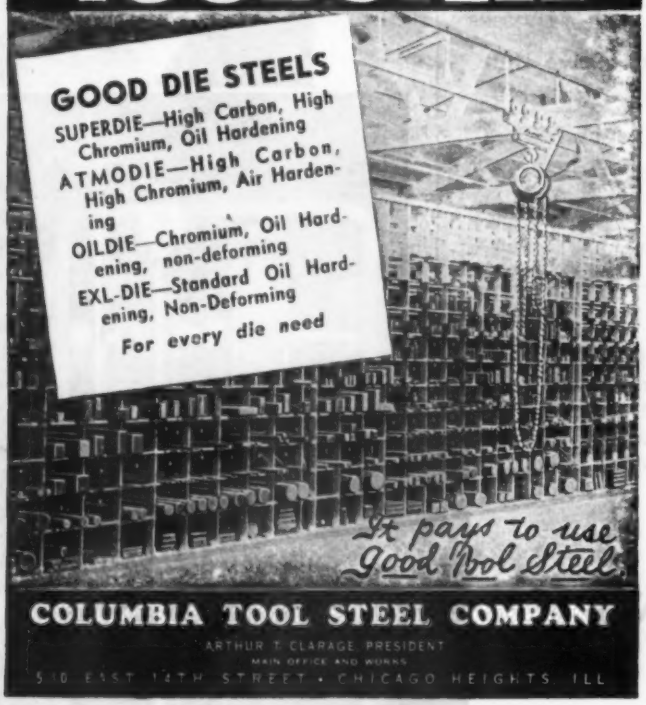
4 DRILL PRESSES IN 1

Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

CHICAGO DRILLET CORPORATION

919 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

Columbia TOOL STEEL


GOOD DIE STEELS
SUPERDIE—High Carbon, High Chromium, Oil Hardening
ATMODIE—High Carbon, High Chromium, Air Hardening
OILDIE—Chromium, Oil Hardening, non-deforming
EXL-DIE—Standard Oil Hardening, Non-Deforming
For every die need
It pays to use Good Tool Steels

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
510 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

DIES TAPS

GEO MET RIC

Right in the Lead

THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

Famous for

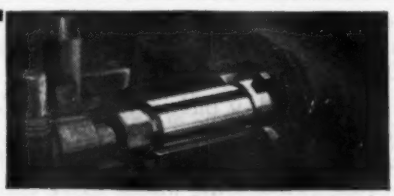
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 238 Jan. 18, '40, American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

SAVE Setting-Up Time with



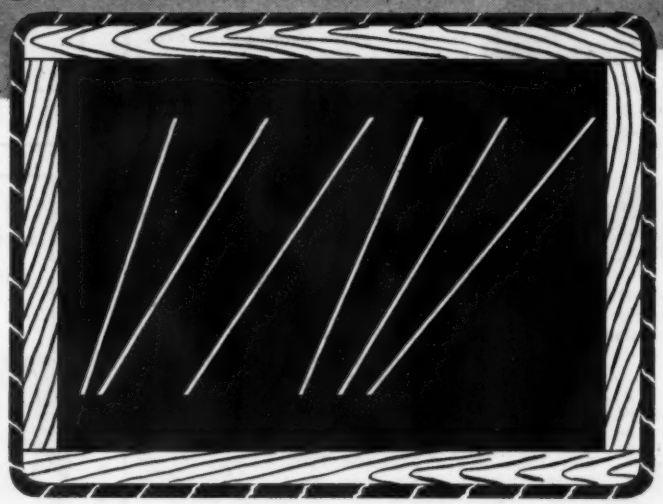
★ ★ ★ ★ ★

NICHOLSON EXPANDING MANDRELS

Set of 19 of these economy, precision tools does the work of 193 solid arbors. Hardened tool steel. 2 types, all sizes. Sold singly or in sets. Prompt delivery. Bulletin 1043.

W.H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

Which 2 lines are parallel?



With a pair of dividers it would take a "man-minute" to figure out which of the above lines are parallel. That's very simple. But to determine which cutting oils are parallel in performance is not so simple. In fact there are no two "lines" of oils that are identical.

There is only one TOOLIFE – it has 3 distinct benefits.

- A special wetting agent to bring the oil closer to the cutting edge—carrying away more heat.
- An oil of highest quality for better finish.
- A germicidal ingredient which cuts down man hours lost from oil dermatitis.

TOOLIFE
CUTTING BASE

It has no parallel

Write for Information and Literature.

Your guarantee is this label.

CUTS COOLER . . . TOOLS LAST LONGER

SPECIALTY PRODUCTS COMPANY

Manufacturers of Sulphur, Lard and Soluble Cutting Oils and Bases

190 Warren Street, Jersey City, N. J.

Additional territories still open to Sales Representatives. Write us at once.

PALMGREN

ANGLE—DRILL PRESS—PRODUCTION VISES

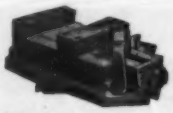
No. 000 ANGLE VISE

Mounted on Swivel "M" Base

For Drilling, Milling, Grinding, Filing, Fitting, Etc. Permits setting up of angle work accurately and quickly without clamps, wedges or make-shift methods. Accurately graduated for all angles, once set it stays locked. Precision machined of semi-steel casting. Jaws are hardened steel—plain or grooved. Sizes 1½" to 8".

HEAVY DUTY PRODUCTION VISES

For fast, heavy work. Adjustable cam locking lever. Movable jaws, hardened and ground. Sizes 3" to 8" Jaws.



FLANGED MILLING MACHINE VISE

Clamps to table of milling machine, grinder, etc. For heavy work. Has hardened and ground jaws 6" wide, 2" deep.

DRILL PRESS VISES

For every purpose. Accurately machined, best semi-steel castings. Long bearing adjusting screw. Jaws hardened steel—plain or grooved. Sizes 1½" to 4".

No. 250 MILLING ATTACHMENT VISE

MAKES MILLING OPERATIONS POSSIBLE ON LATHE

A necessary fixture for small shops and emergency work in large shops. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical angle adjustments. Easily mounted on cross slide and held by one T-Slot bolt. PALMGREN VISE has 2½" Jaws opening full 2⅛". Depth Jaw 1-7/16", one plain and one grooved jaw for holding round pieces. Height 10½", Price $24.75.

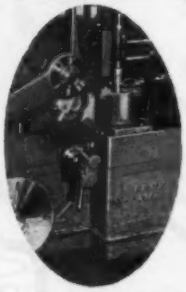
WRITE FOR CIRCULAR 348. Contains full description and prices of our complete line of vises.

CHICAGO TOOL and ENGINEERING CO.

8354 South Chicago Avenue Chicago 17, Ill.

BUILT BY E. R. SEIFERT, INC.

AUTOMATIC...COMBINING SEVERAL OPERATIONS



This machine takes flat copper wire from reel . . . and through a series of automatic operations, including insertion of insulating paper between turns, ejects completely finished automobile starting motor field coils.

We review your special automatic wire forming or coil winding problems and offer standard machines in stock . . . or design special machines to your specifications.

E. R. SEIFERT, INC. 202-204 S. BEECH ST.

Syracuse 10, N. Y.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4090

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.

MANCHESTER, CONN.

LUERS

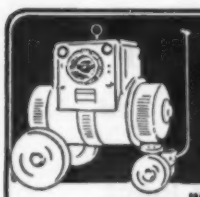
Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

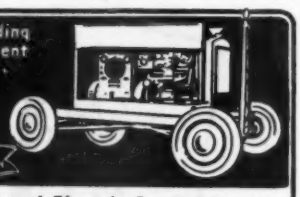
Produced under License Issued by John Milton Luers Patents Inc.



HOBART

"Simplified" arc welders

HOBART Welding catalog. Sent on request.



HOBART BROTHERS CO., Box A M 4-26 TROY, OHIO

"One of the World's Largest Builders of Electric Arc Welders"

. . . when you must use a soluble oil— and the job is tough

Solvol has extra lubricating qualities which enable it to perform metal cutting jobs beyond the scope of other soluble products. This unique product, plus the skill of Stuart Oil Engineers, can solve machining problems for you. D. A. Stuart Oil Co. Ltd., 2729 So. Troy Street, Chicago 23, Illinois.

Stuart's SOLVOL

(Aquamix)

LIQUID CUTTING COMPOUND

D. A. Stuart Oil CO.

LIMITED

ESTABLISHED 1865

FOR ALL CUTTING FLUID PROBLEMS
Stocks in Principal Metal Working Centers

LIKE TO PICK YOUR OWN *Diamonds?*

Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select unmounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances leave the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

CLEVELAND

Automatic Tapping Machine

Model DB with
Special Rapid Approach

• Here is a high speed, accurate tapping machine that can be operated 100% automatic or manually by the simple turn of a lever from *Automatic* to *Hand*. On automatic, operator merely loads and unloads machine after each tapping cycle.

The Cleveland has FIVE Outstanding Advantages

Rapid Approach and Retract
Split Second Reverse
Lead Screw Controlled
100 Per Cent Automatic
Precision Depth Stop

Full descriptive bulletin available. Write for your copy today.

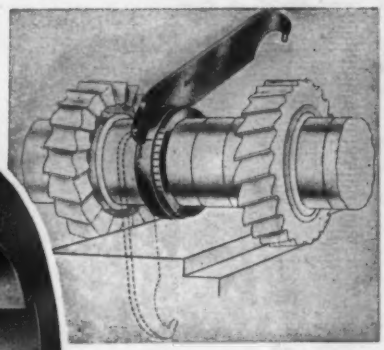
THE CLEVELAND TAPPING MACHINE CO.
3610 Superior Avenue • Cleveland 14, Ohio

SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling setups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

Write for illustrated bulletin $120-1

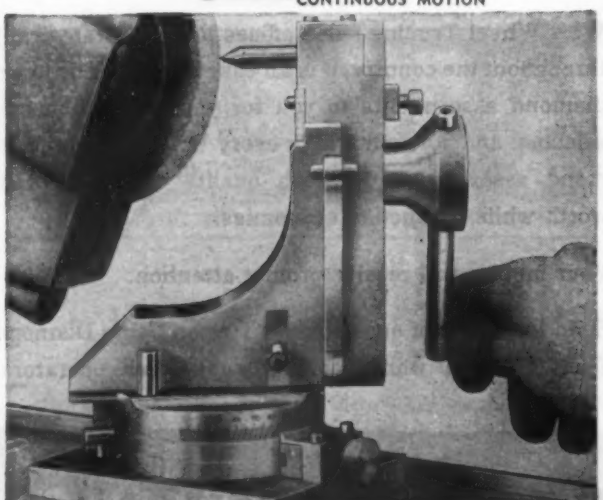
DAYTON ROGERS MFG. CO.
2835 12th Ave. S. Minneapolis, Minn.

USE

Fluid-motion

for modern form-dressing

ONE SETTING HANDLE CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

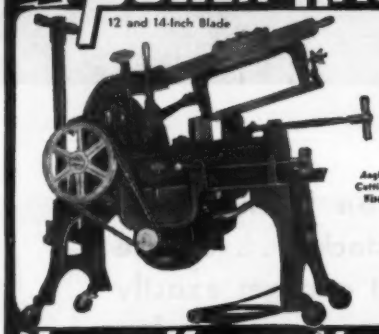
FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.
477 MAIN STREET
EAST ORANGE 1, N. J.

POWER HACK SAW ★

12 and 14-Inch Blade



LOW PRICED
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READY TO WORK
STURDY
ECONOMICAL

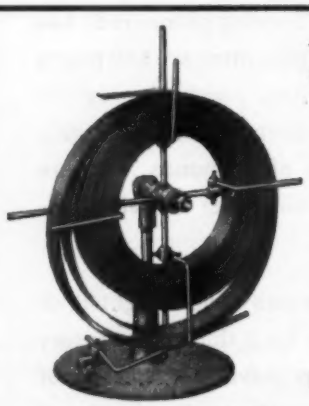
Angle Cutting Vise

Write for Bulletin No. 100

MILLER-KNUTH MFG. CO. OMAHA, NEB.

LITTELL REELS

FEED COIL STOCK FASTER



No. 3 Littell Reel. 300 lbs. capacity. For coil stock.

COIL stock can be loaded, centered and unreeled faster with LITTELL Automatic Centering Reels. They increase production.

Littell Reels are ball-bearing, easy running, strong, durable. Capacities 100 to 20,000 lbs. Spindle and cradle, plain and motor-driven types.

Request Bulletins

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GRINDING "MAGIC" FOR CARBIDE-TIPPED TOOLS AND DIES

You can now precision grind carbide-tipped tools and dies amazingly faster, cheaper with Por-os-way—without burning, without discoloring. Get the Por-os-way wheel with *green* silicon carbide, the wonder grit that's back from war. Try Por-os-way once and you'll use it always!

2 TO 5 TIMES LOWER GRINDING COSTS

IN SHOP after shop you hear enthused machinists passing along the good word about Por-os-way, the sensational *open structure* precision grinding wheel that cuts hardest metals deeper, faster, *cooler.*

Men at the machines *ask* for Por-os-way.

They know how it rough grinds *and* precision finishes . . . with astounding speed . . . fewer rejects . . . and longer life. They know its amazing three-year war record first hand, and they've shared in its success.

When *you* ask for Por-os-way and put it to work you'll cut grinding costs 2 to 5 times, help keep war production up and make the boss happy. For *proof* of Por-os-way's results call in a Por-os-way engineer. He and Por-os-way will open your eyes to new feats in grinding! A. P. de Sanno & Son, Inc., 470 Wheatland Street, Phoenixville, Pa., Since 1893.

GROW with America! We can all earn more, buy more, have more after the war if labor, business and government are progressive, fair and cooperative.

*T. M. Reg. U. S. Pat. Off.

← LOOK AT THE DIFFERENCE!

Your eye tells you at a glance why Por-os-way is *different.* See the *extra porosity* that gives you over 8 distinct operating advantages!

RADIAC*

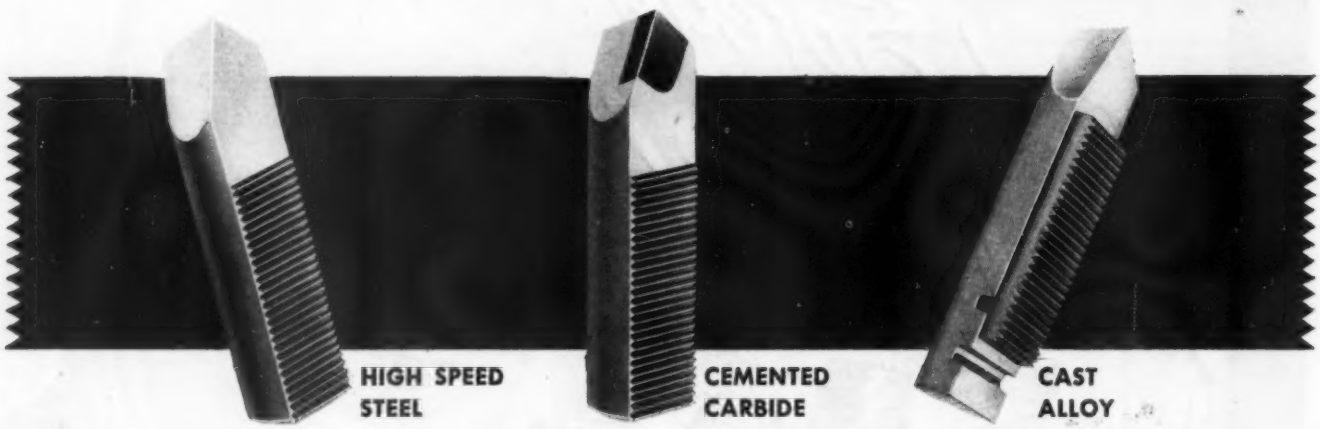
POR-OS-WAY*

The Precision Grinding Wheel

THE WHEEL THAT COSTS THE MOST AT FIRST . . . COSTS THE LEAST AT LAST

POR-OS-WAY SEGMENTAL SURFACE GRINDING MEANS NO MOAN, NO GROAN, NO GRUNT! Give your surface and face grinding a BIG boost with Por-os-way segments. See how they cut faster, dig *deeper* . . . do it quietly by *cutting* the metal, not "scraping" the surface. No fuss, no racket and less time out for wheel dressing, too!

LOVEJOY POSITIVE LOCKING BLADES



FOR LOVEJOY MILLING CUTTERS AND LOVEJOY TOOLS —CARRIED IN STOCK FOR IMMEDIATE DELIVERY

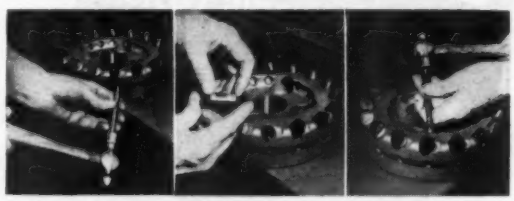
Immediate shipment out of stock is *another Lovejoy service* that backs up the users of Lovejoy milling cutters and other Lovejoy tools. It's a great feeling to know that there will be no delay when you need blades in a hurry. And this service means that there is no need to keep a large stock of Lovejoy blades in your own stock room.

All you need do is check the serial number on the housing of any Lovejoy tool. Write, wire, or phone us this number, and we will do the rest, *immediately!*

You can be sure that the Lovejoy blades that you receive will fit, because of careful manufacture and inspection which insures interchangeability.

High-speed steel blades are of highest quality and carefully heat treated for maximum service; *carbide tipped blades* are carefully brazed and finely finished, and you have your choice of any make and grade of carbide; *cast alloy blades* are especially designed to avoid breakage and are available in Stellite, Rexalloy, Tantung, etc.

Lovejoy blades are positively locked in any Lovejoy tool, and over 50% of every blade can be used up before replacement is necessary. Complete details will be found in Catalog No. 27—write for your copy today!



Tap out the wedge— Move the shoe down— Tap in the wedge—Grind

IT'S AS SIMPLE AS THAT!

Please send me my free copy of "Lovejoy Modern Metal Cutting Tools."

NAME_____ TITLE_____

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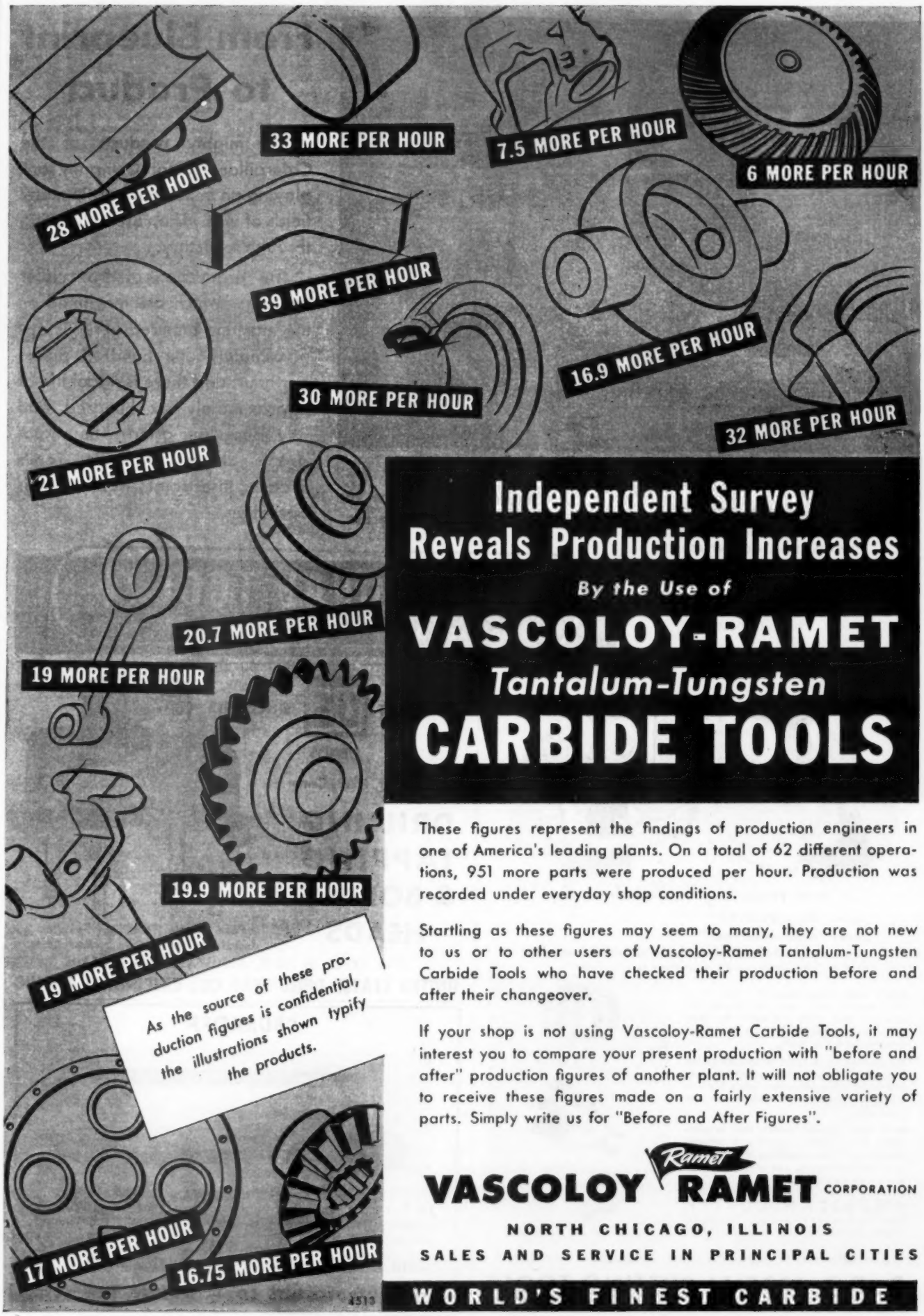
MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS


33 MORE PER HOUR
7.5 MORE PER HOUR
6 MORE PER HOUR
28 MORE PER HOUR
39 MORE PER HOUR
16.9 MORE PER HOUR
30 MORE PER HOUR
32 MORE PER HOUR
21 MORE PER HOUR
20.7 MORE PER HOUR
19 MORE PER HOUR
19.9 MORE PER HOUR
19 MORE PER HOUR
As the source of these production figures is confidential, the illustrations shown typify the products.
17 MORE PER HOUR
16.75 MORE PER HOUR

Independent Survey Reveals Production Increases

By the Use of

VASCOLOY-RAMET *Tantalum-Tungsten* CARBIDE TOOLS

These figures represent the findings of production engineers in one of America's leading plants. On a total of 62 different operations, 951 more parts were produced per hour. Production was recorded under everyday shop conditions.

Startling as these figures may seem to many, they are not new to us or to other users of Vascoloy-Ramet Tantalum-Tungsten Carbide Tools who have checked their production before and after their changeover.

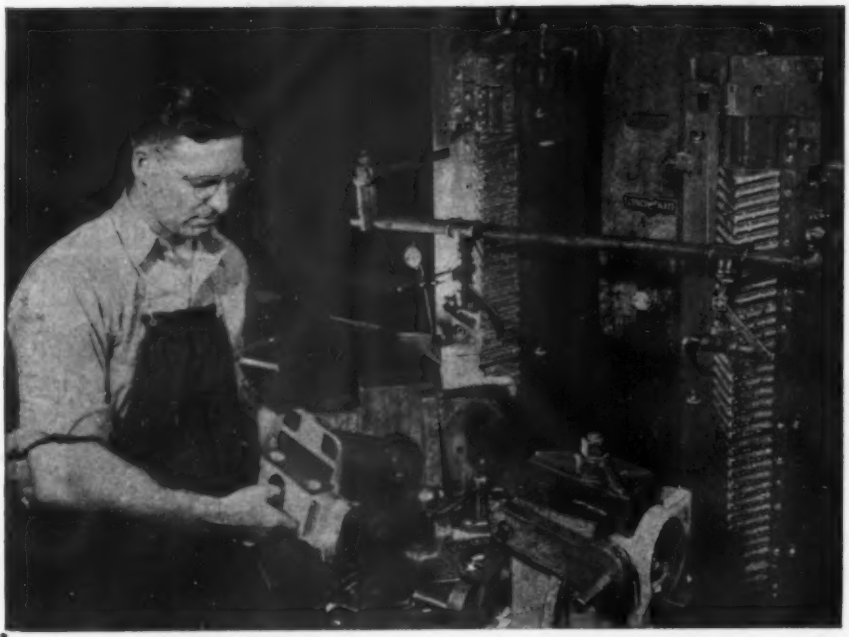
If your shop is not using Vascoloy-Ramet Carbide Tools, it may interest you to compare your present production with "before and after" production figures of another plant. It will not obligate you to receive these figures made on a fairly extensive variety of parts. Simply write us for "Before and After Figures".

VASCOLOY Ramet RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

SALES AND SERVICE IN PRINCIPAL CITIES

WORLD'S FINEST CARBIDE



Front Idler Bearings Machined at Caterpillar Tractor Company

From Blueprint to Product

The mighty products of the Caterpillar Tractor Company are playing an important part in many fields of war. They are bulldozing through to victory.

The production of front idler bearings—which are machined on the machine pictured here—is approximately one hundred pieces per hour, and there is a tool life of approximately six hundred and fifty pieces per grind. The photograph shows National Tool's broach inserts at work in this operation.

NATIONAL TOOL PRODUCTS

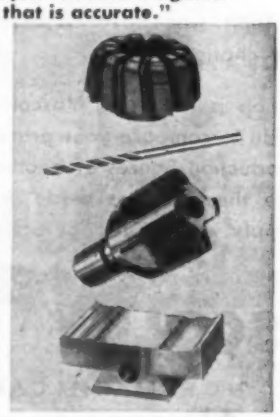
BROACHES • HERRINGBONE CUTTERS
SLITTING SAWS • COUNTERBORES
REAMERS • GEAR SHAPER CUTTERS
GEAR CUTTERS • MILLING CUTTERS
CIRCULAR AND FLAT FORM TOOLS
HOBS, GROUND AND UNGROUND
SPECIAL TOOLS

National Tools are the Shapers of Progress

NATIONAL TOOL Co.
11200 MADISON AVENUE CLEVELAND, OHIO

A new version of "Man bites dog"

John: "Yes—it's O.K."
Jack: "What—that tool?"
John: "No—the old mike—I just checked it against this A.C.E. reamer—I know that is accurate."



John's ideas about inspection may be a bit irregular—but it is a fact that A.C.E. special cutting tools are noted for their accuracy, another reason for the great demand for A.C.E. tools.

We are making all types of special cutting tools, 100% for war plants—and we have had to get out some orders pretty fast—to speed the production of important war materials.

Send your special cutting tool requirements to us—both hi-speed and carbide-tipped—we'll do everything in our power to make the tools as you want them and when you want them.

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31745 MOUND ROAD • WARREN, MICH.

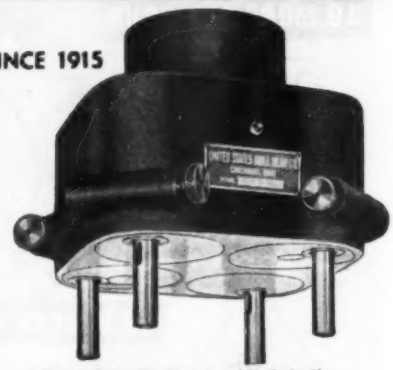
BUY MORE WAR BONDS—HELP CUT DOWN THE AXIS

A.C.E. SPECIAL CUTTING TOOLS
HI-SPEED OR CARBIDE-TIPPED

STANDARD US HEADS SINCE 1915

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

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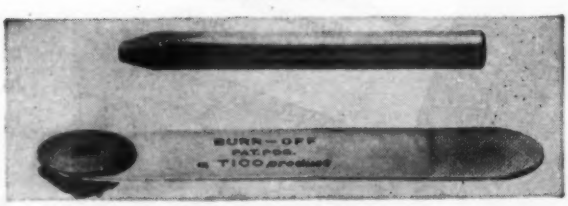
UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

"BURROFF"



PAT. NO. 2351578

For fast clean removal of burrs and chamfering holes (inside & outside) of multi-walled parts—where regular solid countersinks will not reach.

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. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from 1/2" to 3 1/2". Several widths of cutters can be used in each size.

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NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

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When the squat little K-guns on a sub chaser let loose a belch of flame that sends deadly TNT-laden depth charges hurtling into the murky sea, chances are it's curtains for another of Adolf's sea wolves. Marking and numbering the precision made parts of depth bombs in one operation is another important wartime application of Noblewest No. 4—the world's most popular all-purpose marking machine. Can be tooled for marking flat or round surfaces, graduating or automatic serial numbering.

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Marking Specialists Since 1904
EAST HARTFORD, CONN.

MARK IT BEST WITH NOBLEWEST® NOBLEWEST IMPROVED MARKING DEVICES

*A U Boat is hearse in Navyese

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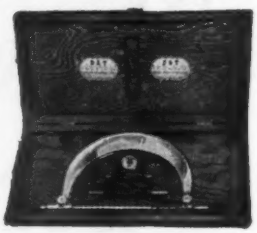
There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.



• D & T Bow Micrometer 0 to 6 in. capacity

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Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

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The outstanding service of Reeves Army Twill in wartime is dramatically told in the diary of a shirt which belonged to an officer of the Army Air Force. This story speaks volumes for Reeves Army Twill for the shirt which is three years old has seen the world, and still makes a presentable appearance after having been laundered over fifty times under all kinds of adverse conditions.

- *It spent the summer of 1942 in Washington, D.C. where it was laundered many times at regular commercial laundries.*
- *In March 1943 it went to Tripolitania where it was washed by Arabs.*
- *In Sfax and Sousse, Tunisia, it was laundered by French and Italian women.*
- *February 1944 saw this shirt on board a British Troop Transport in the Mediterranean where it was washed by Indian bearers.*
- *It spent two weeks in Cairo, traveled to Bombay and then to an airdrome east of Calcutta.*
- *For the next six months, the shirt was laundered after each wearing which was particularly hard on it because the Indians didn't use soap.*
- *It flew all the way back from India to America and is still in wearable condition with a high tensile strength which compares favorably with that of many fabrics when they are new.*

Reeves Army Twill is one of the Reeves Fabric Group, all of which have been invasion-tested, and are destined to do an outstanding peacetime job in work clothes and sportswear. *For further information regarding the post-war uses of these fabrics, write to our New York office or to any of our representatives.*

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THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth Marine Herringbone • Mountain Cloth • Warrior Twill*

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BARRETT OIL EXTRACTION SYSTEMS

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The Barrett Centrifugal Oil Extractor removes 99½% of the recoverable oil from chips and turnings in two minutes or less. We are also prepared to furnish complete Barrett Oil Recovery and reconditioning systems including extraction, sterilization and sedimentation equipment. The units involved are available in various sizes individually or as a group, arranged for full manual control, semi-automatic control, or full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

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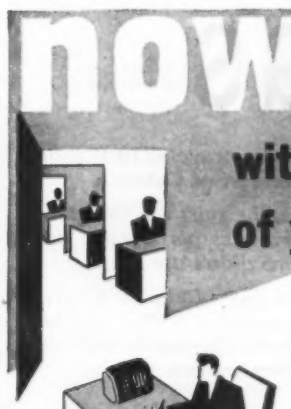
Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**
Designers and Builders of Centrifugal Machinery

now.. direct contact with every member of your staff!



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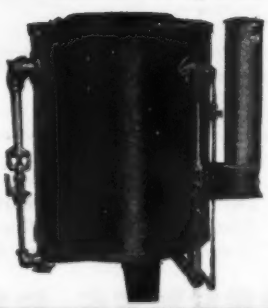
NO BLOWER or POWER NECESSARY . . . just connect to gas supply



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Used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

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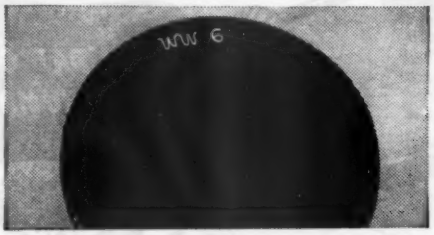
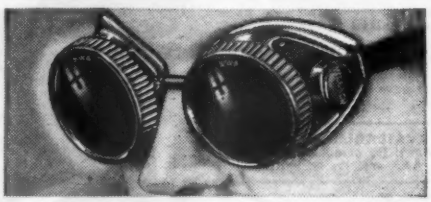
WILLSON-WELD LENS FEATURES



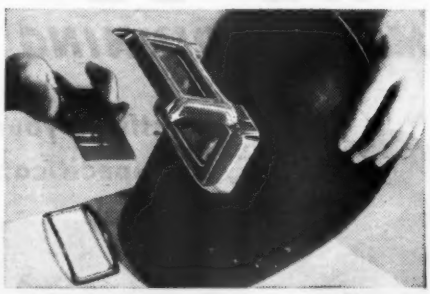
MARKED

When you see the WW trademark on a Willson-Weld lens, it's your assurance of dependable eye protection for welders. The shade number on each lens, determined by individual photometer test, permits easy selection. Never take a chance on unidentified welding glass.



MATCHED

The WW also means that for either goggles or helmets, Willson-Weld lenses are matched to Federal specifications for reducing intensity and glare of visible light and filtering out dangerous ultra-violet and infra-red rays.



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Replaceable clear cover glasses protect Willson-Weld lenses from pitting. Lens and cover glass economical to replace. Lens easily changed for different types of welding.

For welding eye protection consult your Willson distributor or write direct to Dept. AM-8.

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PRODUCTS INCORPORATED

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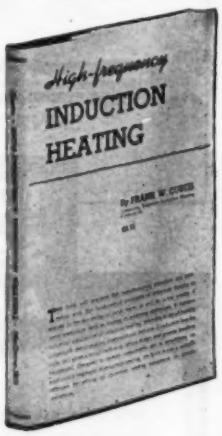
to stepped-up production with high frequency induction heating

Here is your answer to production problems in metal working—a technique of applying high frequency current to give rapid, localized, intensive heat . . . quickly, easily . . . and *economically.*

Now all the material you need on theory, practice, and application has been gathered together in one convenient and comprehensive book—ideal both as an introduction to the possibilities of induction heating, and as a ready reference handbook of design and procedure.



Every manufacturing executive and technician with metal working problems requiring high temperatures—for hardening of metal parts, joining of metal assemblies, or similar operations—will find in this book that there are tremendous possibilities for more efficient, more uniform, more economical production through the use of high-frequency induction heating.

Just Published!

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By Frank W. Curtis

Consulting Engineer, Springfield, Massachusetts

235 pages, 5¼ x 8¼, 249 illustrations, $2.75

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CONTENTS

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3. Design of Induction-Heating Coils
4. Brazing, Soldering, and Joining
5. Hardening and Heat-treating
6. Fixtures for Induction Heating
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- . . . uniform results according to fixed time schedules, with rejections almost eliminated
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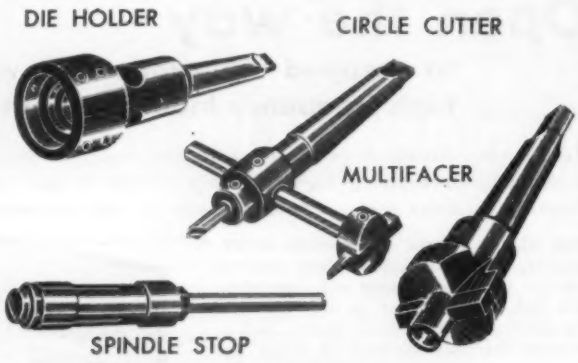


TOOLS THAT SAVE TIME AND COST

Any of these Rieger tools will pay for itself on one short run of identical work. For instance, use the Circle Cutter for a single lot of gaskets and you can charge it off. Same with the Die Holder for a lot of threading, or the Multifacer for a lot of counterbores, or the Spindle Stop for a lot of turned pieces. But you'll keep using these tools time and again for similar jobs which are always coming up.

● **DIE HOLDER.** Steps for 1" and 1½" round dies. Chases true, straight threads up to ⅝" x 3". With No. 2 Morse taper shank, $13. Other shanks on special order.

● **CIRCLE CUTTER.** For cutting 2" to 8" dia. holes in sheets of metal, rubber, plastic, composition, fibre, wood, etc. Will machine ½" plate steel. Regular models with ½" straight or No. 2 M. T. shank, $18. Other sizes made to order. Can furnish with two bit holders at slight extra cost, for cutting gaskets.

● **MULTIFACER.** For spot-facing, boring, counterboring, valve-seating, and cutting convex or concave annular rings. Any contour you want by grinding insert bit to corresponding shape. Cutting diameters 1" to 5" with three regular sizes of Multifacers ranging in price from $20 to $45. Special sizes made to order.

● **SPINDLE STOP.** Fits ¾" spindle hole. Won't mar wall because expansion is by collet action. Stem can be removed for positioning solid work. Price, $5.50. Other sizes made to order.

REPRESENTATIVES

Harry E. Hummer, 115 Montclair Ave., Newark, N. J.; Jack Brewer, 1151 S. Broadway, Los Angeles 15, Calif.; Schellenbach Machine & Tool Co., 480 Fifth St., San Francisco 7, Calif.; Bridge Machinery Co., 708 St. Paul St., W., Montreal, Que.

MAIL COUPON OR WRITE FOR COMPLETE INFORMATION

THE RIEGER MFG. CO., Dept. AM-4
MIAMISBURG, OHIO.

Send complete information on Multifacers, Circle Cutters, Spindle Stops, and Die Holders.

Name

Company

Street Address

City Zone State

That's right. The AIR-MASTER is not human particularly when it concerns those destroyers of health and machinery—dust and grit. The AIR-MASTER sucks up those tiny demons of destruction right at the moment they fly off the whirling wheels of grinders and buffers. Never gives them a chance to get into the air—to injure the lungs of your employees—to harm sensitive mechanisms of fine machinery.

To master dust and grit, install the AIR-MASTER. Fully self-contained—efficient, rugged, dependable. A size for every grinder and buffer. Write for full details.

NOW AVAILABLE—Two, Three and Five H.P. grinders and buffers on AA5 priority or better.

The Cincinnati

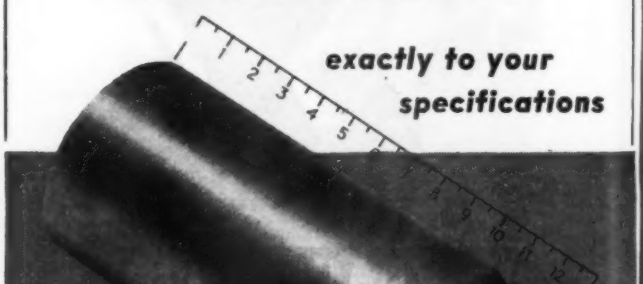
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

2615-9 Madison Rd.

AL-LO METAL SPINNING

exactly to your specifications



AL-LO offers long specialized experience and complete modern facilities for metal spinning of every description and design in all metals.
All work is finished to the closest limits of accuracy.
We also are equipped to handle work involving fine production welding and brazing.
Investigate spinning as the solution to your production problem.
Send your specifications—ask for our quotation.

This typical AL-LO produced part is made from a flat ⅛" sheet, formed into a tube, welded and then spun and drilled.

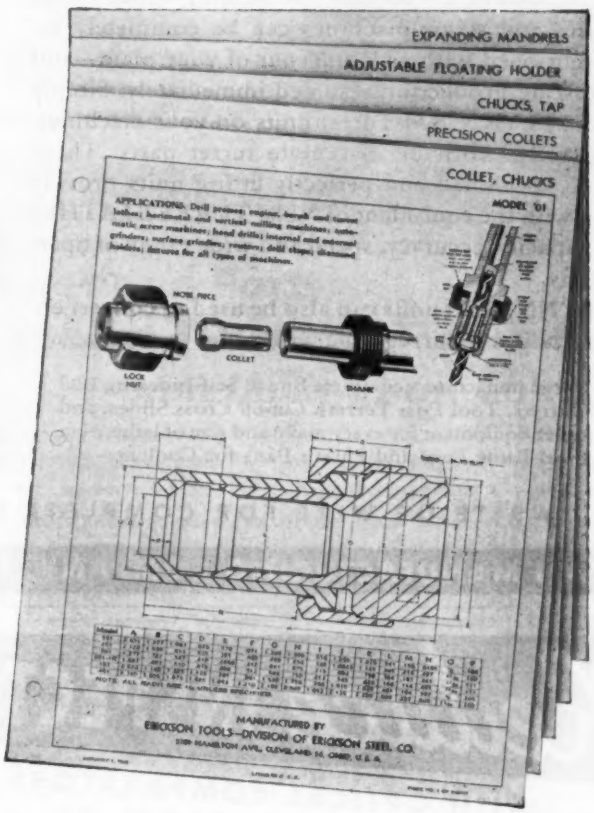
ALEX LOWENSTEIN
301 WATER ST. BINGHAMTON, N. Y.
"Production Metal Spinning Experts"

For New Development and Retooling Work

GET THIS

FREE

ENGINEERING SERVICE


EXPANDING MANDRELS
ADJUSTABLE FLOATING HOLDER
CHUCKS, TAP
PRECISION COLLETS
COLLET, CHUCKS
MODEL 01
APPLICATIONS: Drill presses; engine, bench and turret lathes; horizontal and vertical milling machines; automatic screw machines; hand drills; internal and external grinders; surface grinders; routers; drill chucks; diamond holders; fixtures for all types of machines.
WORK PIECE
COLLET
LOCK NUT
SHANK
MANUFACTURED BY
ERICKSON TOOLS—DIVISION OF ERICKSON STEEL CO.

NEW Erickson Collet & Chuck Data Sheets AVAILABLE NOW!

If you have any type of fixture or holding problem today, these new Data Sheets will help you. They include detailed drawings and specifications of Erickson Model 01 and 02 Chucks, Precision Collets, Adjustable Floating Holders, Expanding Mandrels and B & S Type Adjusting Holders, all of which can be adapted to your own specific problem. The sheets are punched with 3 holes and when inserted in your product file, will give you a complete new index of Erickson precision chucking equipment. With them you can solve most holding problems which will arise in your design and production work.

ERICKSON TOOLS
2306 Hamilton Avenue • Cleveland 14, Ohio

Send Coupon Today

DEPT. A OF ERICKSON TOOLS
2306 Hamilton Avenue • Cleveland 14, Ohio

☐ Send new Data Sheets A on Erickson Collets and Chucks at no cost whatever.

☐ Catalog A on entire line of Erickson products.

FIRM NAME .....

ADDRESS .....

City ..... State .....

YOUR NAME .....

LYNN

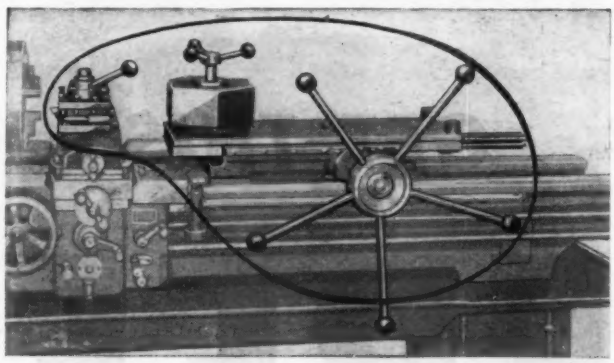
Reconditions Your TURRET LATHES and SCREW MACHINES *Overnight at Low Cost*

Puts Idle or Unproductive Lathes Back Into FULL-CAPACITY PRODUCTION AT ONCE

● No delays, no tedious overhauling—your turret lathes and screw machines can be completely reconditioned without going out of your plant—and full-scale production resumed immediately. Simply mount LYNN Bed Turret units on your machines, replacing worn or inaccurate turret parts. These finely machined and perfectly fitting units provide you with the equivalent of NEW TURRET LATHES in capacity, accuracy, speed and wide range of operations.

LYNN turret units can also be used to convert engine lathes to turret lathe work.

We manufacture a complete line of Self-Indexing Bed Turrets, Tool Post Turrets, Cut-off Cross Slides, and other equipment for every make and size of lathe. Also Steel Lathe Legs and Splash Pans for Coolant.



The lathe above has been reconditioned with a LYNN BT-3—Self-Indexing Bed Turret and a LYNN Precision Tool Post Turret. The Bed Turret has 9½" hex head, 6 positions, 10" turret travel, automatic index. The turret base is machined at factory to fit the particular make of lathe on which it is to be mounted.

WRITE OR WIRE FOR COMPLETE DETAILS . . . OR SEE YOUR JOBBER

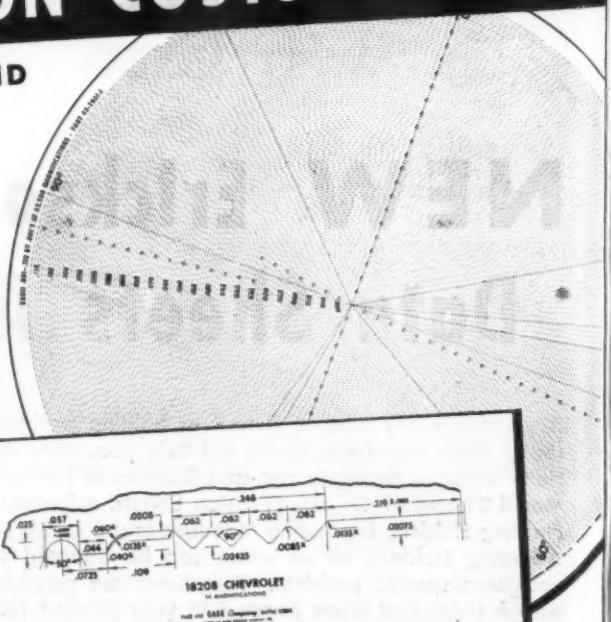
LYNN MANUFACTURING COMPANY, 224 Elroy St., Minneapolis 8, Minnesota

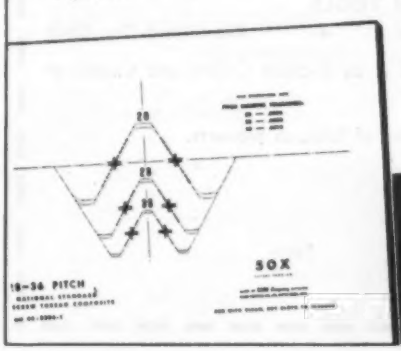
Reduce INSPECTION COSTS . . . . . .

WITH OPTICAL COMPARATORS AND GAGE *Company* PRECISION *Plastic* COMPARATOR CHARTS

The last word in accuracy. Made of heavy, sturdy plastic, .100 thick, free from warp, curl or growth. Remarkably low in cost — many standard radii, thread form and miscellaneous checking charts available. Special charts constructed to order, afford added comparator use, often replacing many mechanical gages at reduced inspection costs. In use by hundreds of plants throughout the country on production work and in tool rooms.

Write for complete particulars indicating comparator equipment. Special chart designs submitted at no cost by engineers who have worked with comparators for more than a quarter century.





MADE EXCLUSIVELY BY GAGE *Company* DIVISION
BATTLE CREEK · MICHIGAN

Also makers of precision ground master gages for projection set-ups · profile gages, templates and flat cams for contour machining operations of all types · fixtures and devices for comparators

CONTRACT WORK

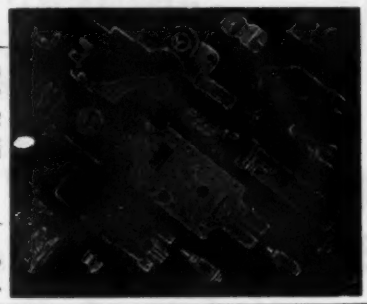
PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRET
- MILLERS
- SHAPERS
- GRINDERS
- LATHES
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
189 Franklin Ave., NUTLEY 10, N. J.

STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS



Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.
We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

"GREATER SAVINGS WITH GREIST"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

• Machines and Parts,
• Special Tools and Fixtures,
• Cam Milling, on Contract

Your engineering problems will receive efficient and economical service in our modern plant manned with skilled workers. Contact us today for prompt quotations on your blueprints or samples.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

HIGH PRODUCTION
MILLING — DRILLING — GRINDING
24 hr. service on
TOOL AND CUTTER GRINDING
Experimental Work — Background — Instrument — clock mfg.

DUDLEY F. FASOLDT & SON
PROSPECT HEIGHTS RENSSELAER, NEW YORK

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N.J.
(Makers of J.&S. Radii & Engle Dressing Tools)

AVAILABLE SCREW CAPACITY
¼ to 4½ Automatic and Hand Screws
Including Necessary Secondary Operation
Forward Samples and Blueprints for Quotations
BRIDGEWATER SCREW PRODUCTS CO., Bridgewater, Mass.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

INVENTIONS SOUGHT

Will pay cash or royalty for inventions that would sell to consumers for about $1.00 up to $100.00. Automotive parts and tools, Tire tools, any kind of repair tools, Household articles or small machines.

CONTRACTORS

Let us quote on your subcontracts. TURRET LATHES UP TO 3½" BAR FEED. Engine lathes up to 18" Swing. Milling machines up to 36" tables. Grinding, Welding and other supporting equipment.

DEMERS MACHINE PRODUCTS CO.
331 PLEASANT STREET WORCESTER, MASS.

BUILDERS OF SPECIAL MACHINERY TOOLS & DIES

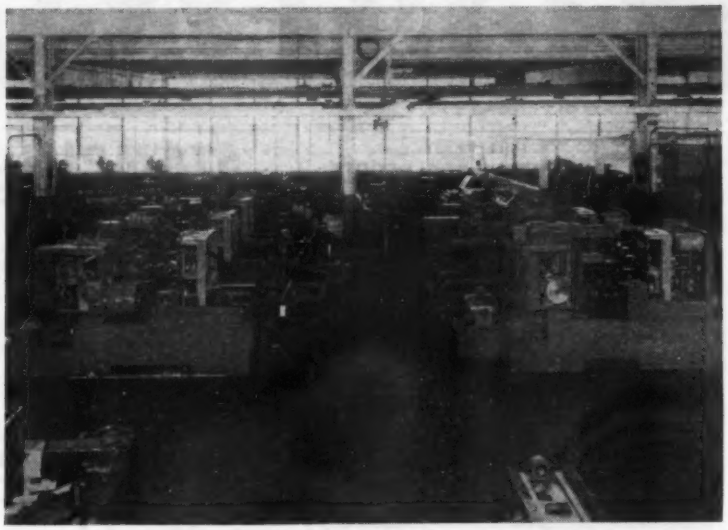
THE SPECIALTY MACHINE TOOL & DIE CO.
923 Market St. (Rear) Wheeling, W. Va.

Put Your Idle Capacity to Work

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of **American Machinist**—about your facilities. Write for rates.

AMERICAN MACHINIST
DEPARTMENTAL STAFF
330 W. 42nd St., N. Y. 18, N. Y.

Lucas THE LAST WORD IN REBUILDING MACHINE TOOLS



A battery of Model 61 New Britain Gridley Automatics being rebuilt » » » »

MORE production—less down time for repairs and adjustment: that's what Lucas-rebuilding means to progressive plant managers. For forty years J. L. Lucas & Son, Inc., have specialized in rebuilding machine tools. We fully guarantee the accuracy of our rebuilt machines. Many of this country's leading manufacturers will enthusiastically testify that we build into them hundreds of hours of productive life. We believe it will pay you to consider putting our 52,000 square feet of floor space, our precision equipment and our skilled craftsmen, to work rebuilding your production machinery.

THIS is the second in a series telling the story behind the LUCAS nameplate on machine tools.

Send for our complete illustrated booklet "Rebuilding the Lucas Way"

LUCAS of BRIDGEPORT

J. L. LUCAS & SON, INC. BRIDGEPORT 5, CONN.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (essential products) has opening for mechanical engineer with some machine design, factory lay-out, and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of applications. P-205, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SPRING MAKER in short order department. High wages. Now on war work but post-war work and position assured. Give full details of qualifications, prior experience, age, and references. P-230, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: Die shop foreman, die sinkers and maintenance men. Salary negotiable according to qualifications. Statement of availability required P-245, American Machinist, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER. Experience production heavy machinery. Fine post-war opportunity. Give fully age, experience, references, salary expected. P-257, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PRODUCT ENGINEERS. Lubricating equipment, pneumatic tools and aircraft products. Able to conceive ideas and follow through to finished product. Ohio plant. Give fully age, experience, references, salary expected. P-260, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

WANTED PRODUCTION Engineer—worth $15,000.00 a year, fully competent to study, start and follow production on new projects for multiple spindle screw machines and all round machine tools. Is needed immediately by one of the largest screw machine companies in the East, Company located in New York, now working one-hundred per cent on war contracts with post-war future. P-259, American Machinist, 330 W. 42nd St., New York 18, N. Y.

RESEARCH ENGINEER. Experience production heavy machinery. Fine post-war opportunity. Give fully age, experience, references, salary expected. P-258, American Machinist, 330 W. 42nd St., New York 18, N. Y

POSITIONS VACANT

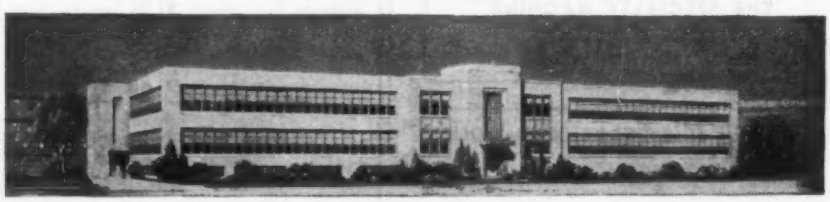
TOOL DESIGNERS—Experienced, $130 plus a week to top men. War work, excellent post-war. Write fully. Associate Engineers, 57 Pratt St., Hartford, Conn.

EMPLOYMENT SERVICE

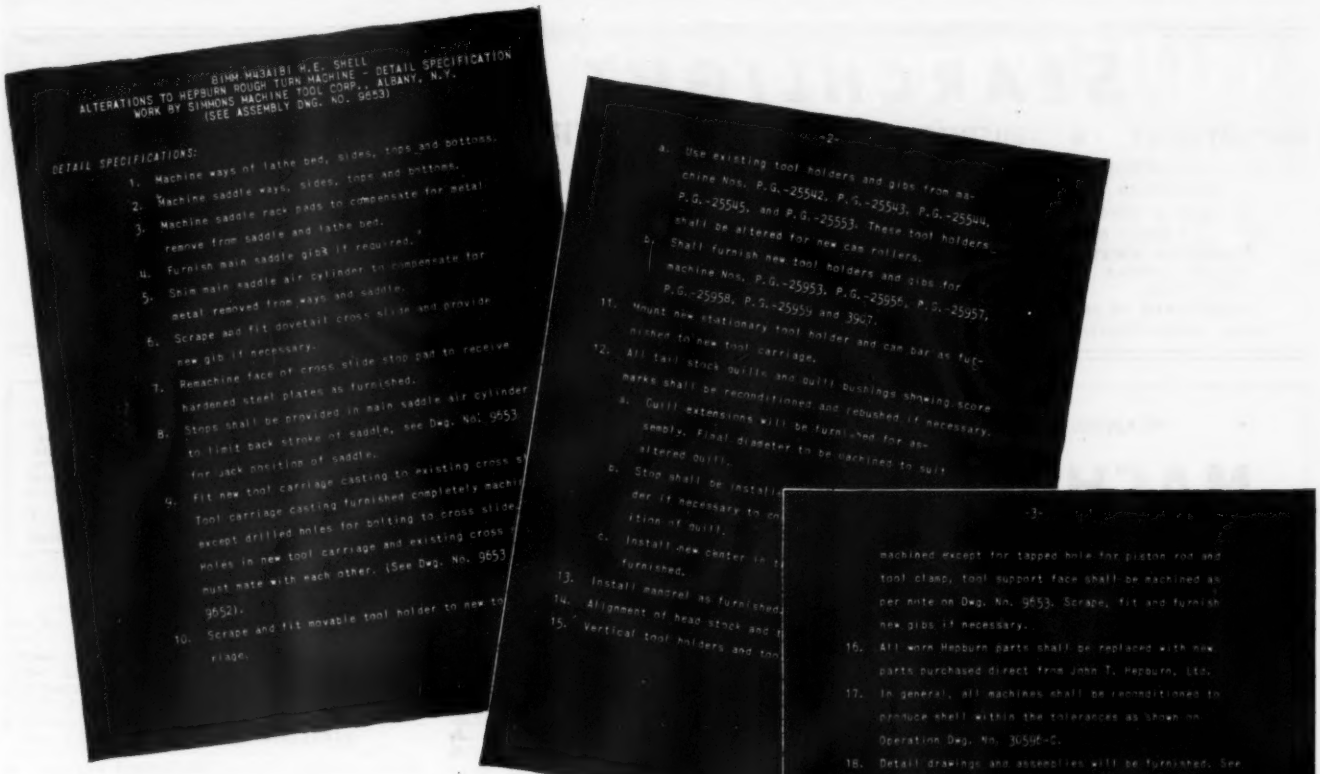
SALARIED POSITIONS—This advertising service of 35 years recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

(Continued on page 282)

WANTED
PRECISION MACHINE DESIGNERS, DRAFTSMEN



MONARCH MACHINE TOOL CO., SIDNEY, O.
Builders of Precision Turning Machines Since 1909



8mm MUSAIBI M.E. SHELL
ALTERATIONS TO HEPBURN ROUGH TURN MACHINE - DETAIL SPECIFICATION
WORK BY SIMMONS MACHINE TOOL CORP., ALBANY, N.Y.
(SEE ASSEMBLY DWG. NO. 9653)

DETAIL SPECIFICATIONS:

1. Machine ways of lathe bed, sides, tops and bottoms.
2. Machine saddle ways, sides, tops and bottoms.
3. Machine saddle rack pads to compensate for metal remove from saddle and lathe bed.
4. Furnish main saddle gibs if required.
5. Shim main saddle air cylinder to compensate for metal removed from ways and saddle.
6. Scrape and fit dovetail cross slide and provide new gib if necessary.
7. Remachine face of cross slide stop bar to receive hardened steel plates as furnished.
8. Stops shall be provided in main saddle air cylinder to limit back stroke of saddle, see Dwg. No. 9653 for jack position of saddle.
9. Fit new tool carriage casting to existing cross s... Tool carriage casting furnished completely machi... except drilled holes for bolting to cross slide. Holes in new tool carriage and existing cross ... must mate with each other. (See Dwg. No. 9653 ... 9652).
10. Scrape and fit movable tool holder to new to... riage.

-2-

a. Use existing tool holders and gibs from machine Nos. P.G.-25542, P.G.-25543, P.G.-25544, P.G.-25545, and P.G.-25553. These tool holders shall be altered for new cam rollers.
b. Shall furnish new tool holders and gibs for machine Nos. P.G.-25953, P.G.-25956, P.G.-25957, P.G.-25958, P.G.-25959 and 3947.

11. Mount new stationary tool holder and cam bar as furnished to new tool carriage.
12. All tail stock quills and quill bushings showing score marks shall be reconditioned and rebushed if necessary.
a. Quill extensions will be furnished for assembly. Final diameter to be machined to suit altered quill.
b. Stop shall be install... der if necessary to ... rition of quill.
c. Install new center in t... furnished.
13. Install mandrel as furnished.
14. Alignment of head stock and t...
15. Vertical tool holders and too...

-3-

machined except for tapped hole for piston rod and tool clamp, tool support face shall be machined as per note on Dwg. No. 9653. Scrape, fit and furnish new gibs if necessary.

16. All worn Hepburn parts shall be replaced with new parts purchased direct from John T. Hepburn, Ltd.
17. In general, all machines shall be reconditioned to produce shell within the tolerances as shown on Operation Dwg. No. 3656E-C.
18. Detail drawings and assemblies will be furnished. See special marked blueprint for furnished parts.
19. Stationary and movable tool holders, Dwg. No. 3655J-C and 10374-B, support faces for tools shall be machined as per note on Dwg. No. 9653.

ANOTHER TYPICAL ENGINEERED REBUILDING JOB

by Simmons

SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY · ALBANY, N. Y.

MANUFACTURERS OF STANDARD AND SPECIAL-PURPOSE MACHINE TOOLS · ENGINEERED REBUILDING **SIMMONS**

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

(Not available for equipment advertising)

10 cents a word minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M. April 25th will appear in the issue of May 10th subject to limitation of space available

WANTED

MACHINE DESIGNER

Exceptional opportunity in a modern, progressive machine tool plant for a machine designer with practical and technical background on medium machinery. Write for personal interview enclosing brief outline of experience to the Chief Engineer.

REED-PRENTICE CORP.
WORCESTER, MASS.

WANTED
MACHINE DESIGNER

Graduate engineer 30-40 for design and development of Textile machinery. Should have previous development experience on existing and new machines. Should be acquainted with modern shop practice and methods. Ability to supervise group of designers and draftsmen necessary. Location: Massachusetts.

State age, experience, details of education, draft status, present salary and salary expected. Post-war opportunity. USES certificate of availability and Draft Board clearance necessary. Send photograph.

P-253, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MAINTENANCE SUPERVISOR

Old established company has opening for a man with factory layout and installation experience. Excellent future possibilities. Age 35 to 40.

Give complete detail of personal qualifications and work history.

P-250, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

WANTED
PRODUCTION MANAGER

Thirty to forty-five years old. Must have successful production record. Midwest firm with forty years background has capacity orders for postwar manufacturing of our regular line of precision made construction and mining tools. Give age, experience and minimum salary expected.

P-243, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

(Continued from page 280)

POSITIONS WANTED

MECHANICAL ENGINEER with 28 years' executive experience. Successfully filled such capacities as Chief Engineer, General Superintendent and Works Manager. Well versed in modern manufacturing methods and equipment. Past connections with large well known concerns producing such products as sewing machines, machine tools, automobiles, aircraft and aircraft engines. Responsible position desired in Eastern location. PW-219, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SCREW MACHINE Engineer with 43 years executive experience, successfully filled such capacities as foreman, general superintendent, and works manager, well versed in modern manufacturing methods and equipment, embodying machining rubber and plastics, camming progressive tooling methods covering every phase of screw machine work, on Brown and Sharpe, Davenport, Acme and Gridley machines, also screw machine tool design, and job shop experience, past connections with large well known concerns producing such products as hollow set screws socket cap screws, radio, automobile parts, fountain pens, aircraft and aircraft engine parts, splendid background in labor relations male and female help, at present employed as plant superintendent, responsible position desired in established company. Where past experience will be valuable. Will be available April 15th. PW-261, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EXPORT EXECUTIVE, fully experienced export routine, industrial experience, knowledge markets, Portuguese fluently, some Spanish, able to build up post-war business, wants position with manufacturer establishing or developing export department; first-class references. PW-262, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF TOOL ENGINEER

From the East, wishes position. Possesses extensive experience in selection of Machine Tools; design of jigs and fixtures for utmost in mass production; experienced toolmaker. Has also engineered plant layout and installation of machine equipment, including powerhouse equipment. Eight years with one company, four years in present position, also previous connections. Position must be permanent.

PW-251, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITION WANTED

EXECUTIVE ASSISTANT, WORKS MANAGER OR ASSISTANT WORKS MANAGER. 34 years old with 20 years of successful practical experience from Apprentice to Assistant Works Manager. Engineering education obtained in evening schools. Well versed in old and new manufacturing methods, progressive ideas, aggressive, sound judgment and ability to assume responsibility. Position need not be in mechanical field although preferred.

PW-249, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

Additional Employment Advertising on pages 280 and 284

MANAGEMENT EXECUTIVE AVAILABLE

Desires association as Department Director or Assistant to busy executive in Manufacturing-Industry field. Experienced in general administration, production planning, scheduling, and control. Experienced in the presentation of brief reports and outlining procedures for the purpose of economical manufacturing costs.

PW-265, AMERICAN MACHINIST
520 North Michigan Avenue, Chicago 11, Illinois

POSITIONS WANTED

MECHANICAL ENGINEER, age 43, desires responsible position with small or medium size company. Broad experience in design and development of special machinery, including chief eng. and plant managership. PW-263, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

TOOL LINES wanted: Mechanical engineer, 9 years' experience as process engineer, 7 years manufacturing supervision; desires several small tool lines. Midwest territory preferred. Exceptionally good contacts in automotive industry RA-264, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 458, 815-15th St., N.W., Washington 5, D. C.

WANTED

ANYTHING within reason that is wanted in the industry served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

WANTED

WE WILL BUY

a going industrial business for cash, and for our own account. Prefer a transaction involving over $100,000.00.

Write to
Industrial Division
TRIPLEX MACHINE TOOL CORP.
WORLD-TELEGRAM BLDG.
NEW YORK 7, N. Y.

Small low pressure die-casting machine wanted for war work.

W-254, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

• • • OUR INVESTMENT IS YOUR SECURITY
• • • SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

SHEARS & BRAKES

Lennox Splitting Shear, 8' throat, ¾" cap., arr. M.
Lennox Bevel Shear, ¾" cap., arr. M.D.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke.
#1 V & O—OBI with dial feed; also hopper.
#3A Bliss adjustable bed, back flywheel; 3" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill. Vertical, 48" Gisholt.
Horiz. #36 Landis-Rochester, 3⅛ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
No. 31 Lucas Horizontal Boring Mill 3".

DRILLING MACHINES

Cincinnati-Bickford 24", 4 spindle, #4 M.T. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2).
Fosdick 13", 2 spindle.

RADIAL DRILLS

3' Dreses, 9" Rd. Column.
2½' Arm 9" Col. Cincinnati Bickford.
4' Arm 11" Col. Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.
3' 9" col. American, S.P.D.

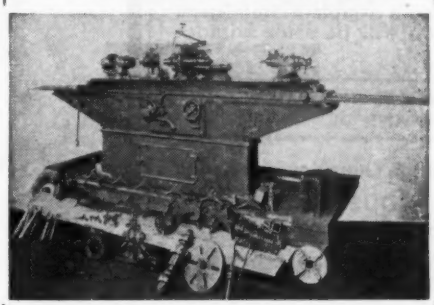
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
#2 Brown & Sharpe Surface Grinder.
14"x36" Cincinnati Cyl., motor driven.
6"x32" Norton Cyl., overhead c/s drive.
12"x36" Bath Universal Grinder, full equipment.
12"x12"x36"—#2 Diamond Surface Grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder, M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10¾". Distance between centers 60". Takes wheels to 12" dia. x ½" to 1" thick. Longitudinal Table travel — 10 changes in rate; range 1½" to 53" per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

No. OY Brown & Sharpe plain (2)
#3, #4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
No. 1½ Brown & Sharpe, Plain (2).

Waterbury Farrell Cold Header, double stroke, open die, ½" cap.
Manville Cold Header, single stroke, solid die, 3/16" cap.

No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.

LATHES

Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
American, 16 x 6 Q.C.G., Geared Head.
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
Seneca Falls Tool Room, 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
16"x6' Hendey Toolroom Lathe with relieving attachment, taper attachment, draw bar and collets. Geared Head.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Lodge & Shipley 16" x 8' 12-Speed Selective Geared Head.

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
14" Rockford crank shaper.
No. 2 Baker Keyseater.

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Standard Automatic Drop Hammer, 300 lbs. Like new.

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No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.

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If you can offer this:

Sound electrical or mechanical engineering experience (with the equivalent of a university degree) . . . ability to qualify as a project engineer, at once or with a few years' more training . . . above-average intelligence and will to get ahead . . . and perhaps some design experience connected with governors or small electric switches,

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An excellent opportunity in keeping with your training and experience in a firmly established, growing company with plants in five Eastern cities, all of which are 100% engaged in war work. Our products are varied, and have established peacetime markets. Openings range up to the level of Chief Engineer for one of our new plants.

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Write me personally, telling your experience, background, and qualifications in detail, and salary expected. Don't hesitate if you happen to be over forty. Your letter will be treated with complete confidence, and no further investigation will be made without your express permission.

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Walter F. Skillin, Vice President in Charge of Engineering

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Company normally employing 1100 is looking for a capable Works Manager.

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An old established Company with progressive policies and modern plant has a real opportunity and future for the right man. Company at present 100% in war work but has standard line of pre-war nationally recognized products for post-war years.

Write full details as to experience, etc. including earning record. Correspondence considered in confidence, with no references contacted without first being released by you.

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Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview

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Complete Diesel Power Plant

Rated capacity 390 KW, made up of 3 units with 160 H.P. Chicago Pneu. diesel engines and complete with switchboards and all accessories.

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New, packed in original boxes. Sizes 5/32 inch, 8,000 lb.; 3/16 inch, 17,000 lb.; ¼ inch, 20,000 lb.; 5/16 inch, 14,000 lb. Manufactured by Fleetweld, A. O. Smith, Arcway, Sureweld and General Electric Company, at 4½c per lb., in quantity lots.

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Complete with Transformers, etc.

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30-40 Mechanical graduate preferred with executive ability. Should have previous experience in Plant Engineering and maintenance. Should be familiar with power plant and machine shop operation. Location: Massachusetts.

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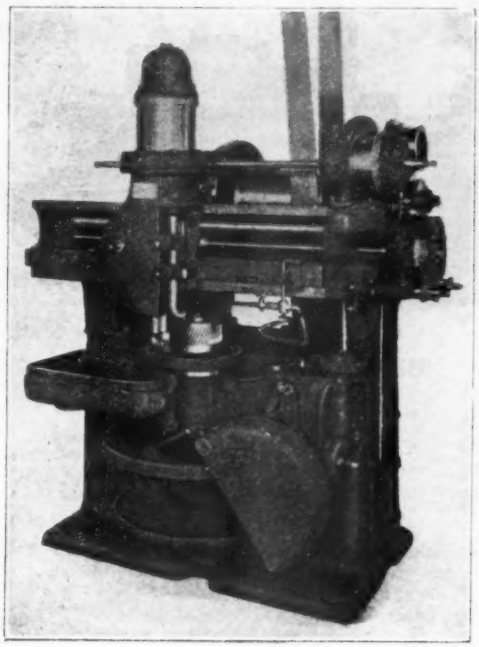

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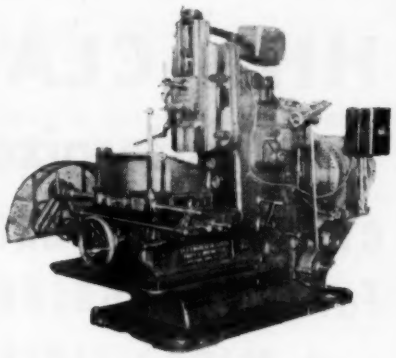

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4" Bar Lucas Horizontal Boring Mill, M.D.
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48"x42"x12'

Dietrick & Harvey equipped with swivel head on cross-rail and one side head.

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38" Colburn, Gear Box, Single Turret Head, for motor drive. (late model.)
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72" wide x 84" high x 14' Gray, Heavy pattern, for motor drive.

PRESS—Knuckle Joint

1500 Ton, 29 Bliss; stroke 4", 40" bet. Hogs.

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84" Niles-Bement-Pond, 28' long, 17' centers, 72" geared face plate DC drive
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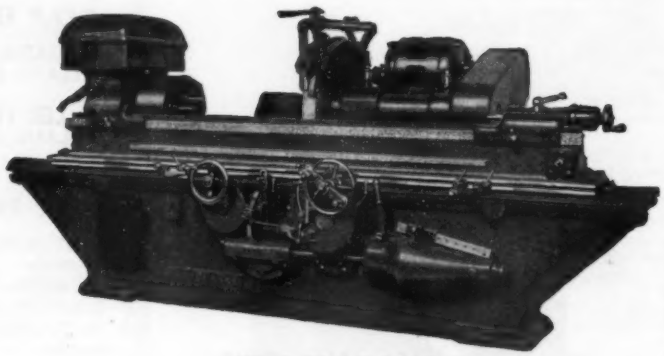
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



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AUTOMATICS, Acme, 9/16" Mod. C 5 spd., M.D.
AUTOMATICS, Acme 2 & 3" Mod. B 4 spindle, M.D.
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AUTOMATICS, Potter & Johnston #5a & 6a
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GRINDER, Brown & Sharpe #5 & 12 Plain, M.D.
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GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
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LATHES, Hendey 24"x10' T.A. M.D.
LATHES, Lodge & S, 20"x10' Q.C. M.D.
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MILLING MACHINES, #2B Rockford Universal
MILLING MACHINES, Becker Vertical #5 & 6
PLANER, Ohio 42"x42"x12' One Head, M.D.

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1—5' American triple purpose plain radial drill, motor on arm.
#4 Cincinnati High Power Plain Miller, S.P.D.
6' American Triple Purpose Plain Radial Drill, M.D.
#3 Cincinnati Vertical Milling Machine H.P.

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52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
42" Bullard New Era Vertical Turret Lathe.
#5 Cincinnati High Power Plain Milling Machine.
7' American Triple Purpose, Motor on arm.

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12" x 96" Landis Plain, S.C.
18" x 85" Landis Plain Self contained.
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96" x 96" x 36' Cincinnati 4 Hds. M.D.

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Boring Mills, 36"-42"-52"-72"-96".
Miller Vertical, #3 B. & S., S.P.D.
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Press, Forging 1000 Ton United, St.-Hyd.
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#4MS Cincinnati DIAL TYPE Vertical Milling Machine, rapid traverse in head

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Machine Tools
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8—#4½ BLISS PRESSES, 1 YR. OLD

Blanking and drawing type. Like new. 110 strokes per minute, 21 x 27" bolster, 12x7" opening in bed, shut height bed to cutting slide 11", shut height bed to drawing slide 14½", stroke of cutting slide 1½". Complete motors, bolster plates, dbl roll feed attachment switches all mounted and wired, variable length scrap cutter. IMMEDIATE DELIVERY.

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No. 12 Van Norman, m.d., latest type
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No. 3B Milwaukee, m.d., double overarm
No. 4 Cincinnati High Power, m.d.

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No. 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d. in base
No. 3V Toledo, s.p.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.

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Hall Planetary Thread m.d.
Hall Planetary Thread, arr. for scroll threading
18" Cincinnati Plain Automatic, m.d.
28" Cincinnati Plain Automatic, s.p.d.
No. 4-36 Cincinnati Plain Hydromatic, m.d., latest type
No. 34-36 Cincinnati Plain Hydromatic, m.d., latest type
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer control, latest type
4½x12" Pratt & Whitney Thread, belt
6x14" Pratt & Whitney Thread, belt
6x20" Pratt & Whitney Type B Thread, m.d. in base
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Thread, m.d.
Becker-Lincoln Type, cone
No. 2 Pratt & Whitney Lincoln Type, cone
No. 12 Pratt & Whitney Lincoln Type, cone
24"x24"x6' Ingersoll Slab, m.d.
36"x36"x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, m.d.
Burr Mfg., m.d.
Carter & Hakes Mfg., Drive All, m.d.

ENGINE LATHES

10"x3½' South Bend Tool Room Lathes, m.d.
13"x6' Willard Geared Head, m.d.
14"x6' American Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x8' Sidney, cone, motorized
16"x6' Lodge & Shipley, cone
22"x16' centers (22' bed) American 100 H.P. InputSuper Lathe, with 100 H.P. D.C. main drive motor, 4 additional motors, power rapid traverse, chip breaker, chip conveyor, etc.
24"x8' American Geared Head, m.d., taper
26"x12' Schumacher-Boye, cone
27"x16' LeBlond, cone
30"x13'6" Niles-Bement-Pond Geared Head, m.d.
36"x10' Putnam, m.d.
36"x12' Wright, cone
36"x14' Boye & Emmes, cone
27"x96" centers LeBlond Geared Head, m.d. latest type
30"x18' American Geared Head, m.d.
30"x26' Lodge & Shipley Geared Head, m.d.
36"x26' Bridgeford Geared Head, m.d.
24"x30' Schumacher-Boye, cone
30"x28' Niles-Bement-Pond Geared Head "Time Saver", m.d., latest type, taper attachment, p.r.t.
30"x28' Niles-Bement-Pond Geared Head "Time Saver", m.d., latest type
36"x28'6" Niles-Bement-Pond Geared Head, m.d., latest type
36"x28'6" Niles-Bement-Pond Geared Head, m.d., taper ottachment, latest type

ENGINE LATHES (Continued)

36"x36'6" Niles-Bement-Pond Geared Head m.d., latest type
42"x26' American Geared Head, m.d., p.r.t.

RADIAL DRILLS

5' Cincinnati-Bickford SuperService, m.d. on arm, 15" column
3' Fosdick Sensitive, s.p.d.
3½' Cincinnati-Bickford Plain, m.d.
4' American Triple Purpose Plain, m.d.
4' American Triple Geared, m.d.
4' Cincinnati-Bickford Plain, gear box
4' Cincinnati-Bickford Plain, m.d. on arm
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared Plain, m.d.
5' Carlton Plain, m.d., fully inclosed head
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5' Cincinnati-Bickford Plain, m.d.
5' Dreses Plain, m.d.
5' Niles-Bement-Pond Full Universal, m.d.
5' Prentice Plain, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice Plain, m.d.
6' Western Plain, m.d.
7' Cincinnati-Bickford Plain, m.d.
8' American Triple Purpose Plain, m.d. on arm

UPRIGHT DRILLS

22" Barnes All Geared Self-Oiling
30" Rich H.D.
40" Barnes Upright, m.d.

GEAR MACHINERY

No. 13LS Fellows Gear Lapper, m.d.
No. 61 Fellows Gear Shaper, belt
No. 64-S Fellows Gear Shaper, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
8" Gleason Mfg. Type Straight Bevel Gear Gear Generator, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
11" Gleason Straight Bevel Gear Generator, s.p.d.
12" Gleason Straight Bevel Gear Generator, m.d.
No. 3-26", 3-36", 4-48", 3-36", 4-36", 8-60" Brown & Sharpe Auto. Spur Gear Cutters
No. 3 26" Cincinnati Spur Gear Cutter
No. 36-S Gould & Eberhardt Gear Cutter, m.d.
No. 36-B Gould & Eberhardt Spur & Bevel Gear Cutter, m.d.
48" Cleveland Gear Hobber, m.d.
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher
No. 2HS Lees-Bradner Spur & Helical Gear Grinder, m.d., cap 12" gears, latest type
Cross Gear Tooth Rounder 24" cap.

AUTOMATICS

4 spindle ⅞" Cleveland Model M, m.d.
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Gridley, m.d.
2¼" Cleveland Model A, m.d.
2½" Cleveland Model A, m.d.
3¼" Gridley, m.d.
4¼" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
No. 6D Potter & Johnston, m.d., arr. for brake drum work
No. 22 New Britain, tapping spindle
No. 23 New Britain, tapping spindle
No. 33 New Britain, m.d. tapping spindle

VERTICAL BORING MILLS

42" Bullard New Era, m.d.
24" Bullard New Era, m.d.
36" Bullard New Era, m.d.
42" Colburn, m.d., 2 heads
52" King, m.d., 2 heads

VERTICAL BORING MILLS (Cont'd.)

48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
10' extended to 16' Betts, m.d., 2 heads
12' Niles, m.d., 2 swivel heads
7' Niles, 2 heads, motorized

HORIZONTAL BORING MILLS

No. 21 Lucas, 2½" bar, m.d.
2¾" Sargent Floor Type
3½" Betts, m.d.
3½" Rochester Floor Type, m.d., floor plate 8x4'
4" Detrick & Harvey Floor Type, m.d.
4" Niles Floor Type, m.d.
4½" Niles Table Type, m.d.
5" Niles Floor Type, m.d.
5½" Niles Table Type, m.d.
4" bar Lucas Table Type, m.d.

TURRET LATHES AND SCREW MACHINES

26" Libby Type C, m.d., 4½" hole
No. 2 Morey, m.d. in base, latest type
No. 2 Pratt & Whitney Shaver, m.d.
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3A Warner & Swasey Universal, m.d., chucking
2½x24" Jones & Lamson, m.d., bar
3x36" Jones & Lamson, m.d., bar
3x36" Jones & Lamson, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
2 spindle 3x36" Jones & Lamson Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., bar
14" Fay Automatic, Flanders Type, m.d.
18" Libby Type A, m.d., chucking
No. 5 Bardons & Oliver Universal, m.d., latest type
20"x7' American Turret, cone
24" Gisholt, cone
24" Steinle, m.d., chucking
28" Gisholt, cone
WoodsTilted Turret model D, cone

ROLLS

No. 3 Ajax Forging Rolls, m.d.
No. 4 Hilles & Jones Straightening Rolls, m.d., cap. 1¼" plate 6' long

PLANERS

24"x24"x5' G. A. Gray, 1 head, m.d.
24"x24"x6' Pond, 1 head, belt
30"x30"x10' American, 1 head, belt
30"x30"x10' American, belt, 2 heads
30"x30"x14' G. A. Gray, belt, 2 heads
36"x36"x10' Niles, belt, 2 heads
36"x36"x12' Powell, m.d., 2 heads
36"x36"x18' Niles-Bement-Pond, var. speed m.d., 2 heads
36"x36"x20' Cincinnati, belt, 2 heads
36" widened to 44"x36"x20' G. A. Gray, var. speed m.d., 2 heads
36"x36"x20' G. A. Gray, belt, 2 heads
36"x36"x12' Woodward & Powell, m.d., 2 rail, 1 side head
36"x36"x16' G. A. Gray, m.d., 2 heads
42"x42"x26' G. A. Gray, m.d., 2 heads
48"x48"x30' Cincinnati, m.d., 4 heads
48"x48"x40' Sellers, var. speed m.d., 2 heads
50"x48"x32' Niles-Bement-Pond, var. speed m.d., 4 heads, box table
60"x60"x16' Niles-Bement-Pond, var. speed m.d., 4 heads
60"x60"x20' Cincinnati, m.d., 4 heads, p.r.t.
60"x60"x20' G. A. Gray, m.d., 4 heads, box table
60"x60"x40' Niles-Bement-Pond, var. speed m.d., 4 heads
72"x72"x24' Niles-Bement-Pond, var. speed m.d., 4 heads
96"x72"x18' Pond, m.d., 4 heads

More than 1,000 machines in stock for immediate shipment

***Main Office and Plant*—Cincinnati—Telephone Melrose 1241**

***New York Branch*—Chrysler Bldg.—Telephone MUrray Hill 4-4246**

THE EASTERN MACHINERY CO.

1004 TENNESSEE AVE. **CINCINNATI 29, OHIO**

IMMEDIATE DELIVERY

AUTOMATICS

½", No. 0G Brown & Sharpe
⅞" and 2" Cleveland Model B
1⅜" Gridley Model G 4 spindle
1⅝" New Britain 6 spindle
2¾" National Acme 4 spindle
4½" Gridley 4-spindle chucking, Model H
No. 454 New Britain, 4-spindle chucking
7" Baird 6-spindle chucking
14"x19" Fay automatic lathe
15" Sundstrand automatic lathe
Gisholt Simplimatic

DRILLS

Sensitive, all makes and types
21" Canedy Otto (New)
20", 21" & 24" Cincinnati upright
20" Barnes box column mfg.
22" Barnes 2-spindle all grd. self oiling
24", No. H3 Barnes Hydram
3½' American radial
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

No. 12 Barber Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 & 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Climatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 1 G Greaby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing Internal
12"x36", 10"x36" & 10"x52" Landis
8"x20", No. 10 & 6"x32", No. 11 B.&S.
10"x24", No. 1 Brown Sharpe univ.
10"x36" & 10"x50" Norton
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
10"x48" Landis crankpin grinder
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x6' Reed Prentice
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
3½" Blomquist Ext. horizontal mill
4½" Universal horizontal mill
5" Barrett cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. ½ Van Norman duplex
No. 2 Kempsmith plain
No. 12 Brown & Sharpe Mfg. elec. drive
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 3 Lees Bradner thread
4" Rice Barton double spline

SHAPERS & PLANERS

16" American shaper
24"x24"x6' Woodward Powell planer
36"x36"x10' Hamilton planer
60"x60"x35' Gray planer

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICHIGAN

CLOSEOUTS

BORING MILLS

HORIZONTAL

2⅛", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

TURRET LATHES

Nos. 2A, 3A W.&S., 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D
Norton 50"x28", M.D.
Gardner 72" disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x30' Putnam S.C.G., D.C.M.D.
36"x30' LeBlond, M.D. 32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
84"x28' Niles Bement Pond, 17' centers

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0, 2 G
5 Spdle Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
Cleveland ⅞", Model M, 4 spindle
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.

GEAR CUTTERS

No. 2, 3, 12 Barber-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel
Pfauter No. 0, M.D.

SHAPERS

20", 24" G. & E.,
16", 20", 26" Stockbridge

RADIALS

4', 6', 8' American Triple Purpose
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

Ingersoll Planer type 36x36x12' 4 hds., M.D.
10" P. & W. Auto.
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B. & S. Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B & S. Universal
Rowbottom Cam Miller
K. & T., B. & S. No. 3 Dbl. overarm, Timken Bearings
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5B Hammer
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
Baush Multiple spindle drill
Burr Keyseater
⅜"x6' Plate Straightening Roll
4x4x⅝" Williams & White Angle Bending Roll

AARON MACHINERY CO.
45 Crosby St.
New York 12, N. Y.

Bullard 42" Vert. Boring Mill, capac. 44" diam., 33" under cross rail, 43½" under turret face, 42⅝" tbl. diam. with 3 jaw comb. or 4 jaw indpdt. chuck built-in, 12 tbl. speed changes 3.3 to 58 RPM, 8 pos. indpdt. feed changes for each hed, vert. hed. move 27", will face 44", turret diam. 16¾", 5 faces 2¾" holes, side hed vert. move. 25", horz. 21" top tbl. to underside side hed slide 25".

★ BORING MILLS

1—60" Colburn Boring and Turning Mill, sw. 62", max. dist. under cross rail 46", tbl. diam. 60", vert trav. of rams 32"
1—Giddings & Lewis Knee Type No. 0 Horz. Bor. Mill., diam. spin. bar 3½", Morse taper No. 5, long. trav. 26", vert. adj. 25½", max. dist. tbl. to spin. cen. 26", dist. face spin. to bar, bar support 60½", tbl. 23¾"x45", M.D.
1—3A Univ. Horz., Knee Type Bor. Mill 3" bar, M.D.

1—Beaman & Smith No. 4 Floor Type Bor. Mill, with 5" bar, No. 6 Morse taper, 48" movement (hand or power) 20 changes of speed 1.2 to 102 suitable for work ¾"-60" diam., auto. feeds either direction for boring .013 to 755 per. rev. of spin., 6 changes

★ VERTICAL MILLERS

3—Becker No. 4B Millers, wk. sur. tbl. 26"x10¼", mtzd., dist. btw. spin. & neck 15"
2—Cincinnati No. 4 Vert. Mill. Machines, tbl. wk. sur. 64½"x16½", size overall 68"x16½", range: long. 42", cross 15", end of spin. to top of tbl. 22", spin. speeds range 14-350
1—Becker Mod. C throat 19½", tbl. wk. sur. 55"x14", cne. hed., M.D.

★ THREAD MILLERS

2—Waltham Thread Millers, sw. over carriage 3", dist. btw. cent. 12", compl. with relieving attmt., M.D., change gears and misc. equip.
3—4½"x12" P.&W. cne. hed. type, min. & max. reg. gears, 29 pitch to 12", min. & max. special gears 40 pitch to 12", depth 3/10"

1—6"x48" P.&W. and 1—6"x132" P.&W. Thread Millers, min. and max. gears 12 pitch to 46", min and max special gears 24 pitch to 72"

★ HORIZONTAL MILLERS

1—Van Norman No. 1 Duplex Horz. Miller, tbl. overall 37"x9", wk. sur. 28"x7¼", long feed 20½", cross 8½", vert. 16, auto. long. feed & cross feed, M.D.
1—Milwaukee No. 1A, Horz. Miller tbl. overall 38¼"x9½", wk. sur. 38¼"x7¾", dbl. overarm long feed 22", cross. 8", vert. 19", M.D.
2—Milwaukee No. 1B Horz. Miller, tbl. overall 38⅜" x9½", wkg. sur. 38⅜"x7¾", double overarm, long feed 22", cross 7", vert. 19", M.D.

★ LATHES

1—24"x12' grd. hed. Hi. Duty American Eng. Lathe, sw. over hed. 26½", hole thru spin. 2-1/16", dist. btw. cent. 83" pan bed, rear tool block, M.D.
1—18"x12' L. & S., 12 speed grd. hed, mtzd. sw. 20½", dist. btw. cent. 73", pan bed, rear tool block, mfg. steps, M.D.
1—14"x6' Rockford dbl. bk. grd., QCG, Eng. Lathe, dist. btw. cent. 36", M.D.
1—14"x6' Bradford QCG, Eng. Lathe dist. btw. centers 34"
1—S. W. Putnam 24"x12' cone driven, LCG, mtzd., dist. btw. cent. 78", sw. over compound rest 10½"

★ *We carry a huge stock!*

Botwinik Brothers
of Mass. Inc.
3 SHERMAN ST., WORCESTER 1, MASS.

PRICED EXCEPTIONALLY LOW FOR IMMEDIATE DELIVERY

LATHES

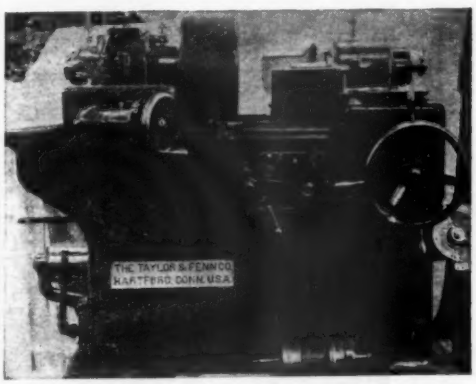
48"x80"x24' Fifield, D.B.G.
42"x18' Niles-Bement-Pond, Q.C. G.H. M.D. Tapes
36"x16' Niles-Bement-Pond, Q.C. G.H. M.D. Tapes
2—36"x14' Niles-Bement-Pond, Q.C. G.H. M.D. Tapes
36"x18' Schumacher & Boye, Q.C. M.D.
30"x17' Blocked to 58" Houston, Standwood & Gamble, Q.C. M.D. B.G. Grinding Attach.
24"x12' Blocked to 30" Johnson, B.G. M.D.
24"x10' Flather, Q.C. B.G. M.D
22"x16' Prentice, G.H. Q.C. S.P.D. M.D.
22"x14' Fifield, S.B.G. M.D.
22"x12' Putnam, D.B.G. M.D.
20"x22' Whitcomb-Blaisdell
20" Multi-Cut Lebiond, G.H. Taper
4—18"x8' Springfield, Q.C. D.B.G. Taper
18"x6' American, Q.C. D.B.G. Taper
15"x8' Seneca Falls, Q.C. M.D. Taper
14"x6' Hendey, Q.C. Taper
13"x6' Lebiond, B.G. M.D. Taper
12"x6' South Bend, B.G.

TURRET LATHES

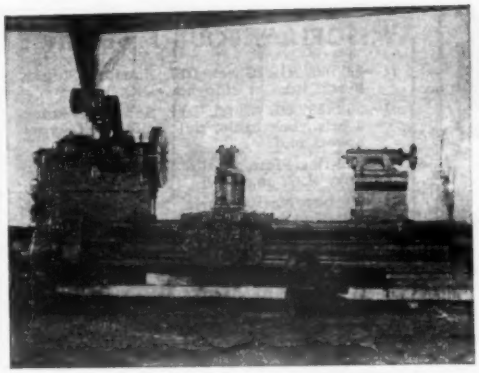
6" Gisholt Tilting, 24" swing, shucking, with motor
4" Bardons & Oliver, M.D.
3½" Potter & Johnson, G.H. M.D. without motor
4"x34" Jones & Lamson, G.H. Steel gears, M.D. 1930 Model
2—3"x30" Jones & Lamson, G.H.
#2 Brown & Sharpe, power feed to turret and cross slide
1¼" Smur & Kamen, M.D.
1½" Pratt & Whitney
#3 Warner & Swasey, hand, 1¼" Cap.
1" Foster, Cone, with motor
#1-B Foster Universal, geared head, for bar work
#6—2" cap, Brown & Sharpe hand screw

BORING MILLS

4", 5", 6" Universal Boring Machine Co.
3½" Niles, horizontal



TAYLOR & FENN INTERNAL GRINDER



30" x 17' HOUSTON LATHE

RADIAL DRILLS

6' Cincinnati-Bickford, S.P.D., 16" Col.
4' Dreses, 4 step cone
3' Cincinnati-Bickford, S.P., 9" Col.
3' Niles, 3 step, 10" Col., M.D.

DRILL PRESSES

MANY TYPES AND SIZES IN STOCK.

MILLERS

36"x36"x10' Ingersoll, Planer type, 4 heads, M.D.
#4 Cincinnati Plain, High Power, S.P.D.
#4 Cincinnati Plain, 3 step, D.B.G. M.D.
#4B Brown & Sharpe, S.P.D. M.D.
#4 Milwaukee, Plain, M.D.
#3-KT Milwaukee, Plain, M.D. 1939 Model
#3 Cincinnati, D.B.G. M.D.
#3 Brown & Sharpe, Plain
#2 Garvin, Plain
#3 Van Norman, S.P. 1942 Model
#2B Milwaukee, Plain, S.P.D. M.D.
#2 Lebiond, Plain, B.G. M.D.
#5 Cincinnati High Power Universal, S.P.D.
#4 Kempsmith Universal (size of #2)
#2A Brown & Sharpe, Universal, S.P.D.
2—#3 Cincinnati Universal, M.D.
#08 Cincinnati Vertical
#2 Brown & Sharpe, Vertical P.F. to table, Arr. M.D.
Model C Becker, Vertical, P.F. to rotary table, M.D.
Model AB Becker, Vertical, S.P.D.
Lees-Bradner Automatic Thread Miller, M.D.
Pratt & Whitney 12"x48" Thread Miller
44"x12" Table Kempsmith, Lincoln type
#12 Brown & Sharpe Production, Arr. M.D.
28"x12" Table Cincinnati, Production.
#7 Becker, Lincoln type
#0Y Brown & Sharpe, P.F. to table.

SHAPERS

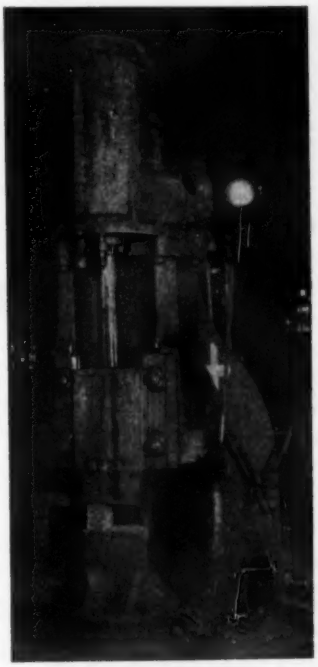
24" Gould & Eberhardt, B.G. M.D.
20" Steptoe, Cone, M.D.
16" Flather, Cone, M.D.
16" Smith & Mills, Cone, M.D.

AUTOMATICS

#00, #0, #2G Brown & Sharpe
#00G Brown & Sharpe, High Speed
1⅝" New Britain, 6 Spindle
4—1¾" Gridleys, M.D.
2—#23 New Britain, 4 spindle Chuckers, S.P.D.
⅝"x7" Cleveland

HAMMERS, PRESSES & OTHER FORGING EQUIPMENT

5" Ajax Horizontal Upsetter
2—R.D. Wood Hydraulic Forging Presses, 2500 and 3000 Ton
2—Watson-Stillman Hydraulic 600 and 1000 tons
Farnham, Hydraulic, 250 tons, 4 post, 4" dia.
2—Horizontal Bolt Headers, 1" & 1½"
6—Steam Drop Hammers, 100, 500, 600, 1100, 1500, 3800 lb.
2000 lb. Steam Hammer
#57 & #58 Toledo Geared Trimming Presses
#73½ Bliss Geared Trimming Press, Fly wheel type
25"x5"x18" Horizontal Hydraulic Pot Valve Plunger Pump
16"x26"x7"x18" Horizontal Hydraulic Pot Valve Plunger Pump
22"x11"x18" Horizontal Hydraulic Pot Valve Plunger Pump
18"x4"x18" Horizontal Hydraulic Pot Valve Plunger Pump
DD55—75 ton Ferracute Blanking & Cupping Double Action Press, 1930 Machine
50 Ton Bull Dozer, Double action
R. D. Wood Accumulator 32" dia. x 18" stroke 600 gal. cap.
#2 Waterbury Header
#0 Baird Header
#60¼ Power, 1200 ton, 22" stroke, 75 HP motor
MISCELLANEOUS PRESSES SMALLER TYPES AND SIZES IN STOCK.



2000 PD. NILES STEAM HAMMER

PLANERS

72"x72"x26' Sellers, 4 heads, M.D.
42"x42"x16' Niles-Bement-Pond 3 Heads, M.D.
42"x42"x10' Gray, 4 heads.
36"x36"x12' Gray, 4 heads.
30"x30"x 8' Pond 2 heads.
24"x24"x 6' Gray, 1 head.
24"x24"x 6' Bullard, 1 head.

GRINDERS

#13 Brown & Sharpe Universal Cylindrical
10"x36" Norton Cylindrical
6"x30" Pratt & Whitney, Cylindrical, M.D.
#11 Brown & Sharpe, M.D.
#70 Heald Internal, M.D.
3—#1G Abrasive Internal, bench type, M.D.
14" Swing Taylor & Fenn, Internal, M.D.
2—8" Heald Rotary Surface, M.D.
#2 Brown & Sharpe, Surface, Mag. Chuck
20"x60" table Pratt & Whitney Vertical Surface, M.D. Mag. Chuck
21½"x50½" Working Surf. of Table, Springfield, Vertical, S.P. M.D.
#4 Gallmeyer & Livingston Universal Tool & Cutter, M.D.
#1½ Cincinnati Universal Tool and Cutter

POWER SHEARS

Adlerhurst Punch & Shear, 1"x6", 25" throat
#20 Pels Punch and Shear
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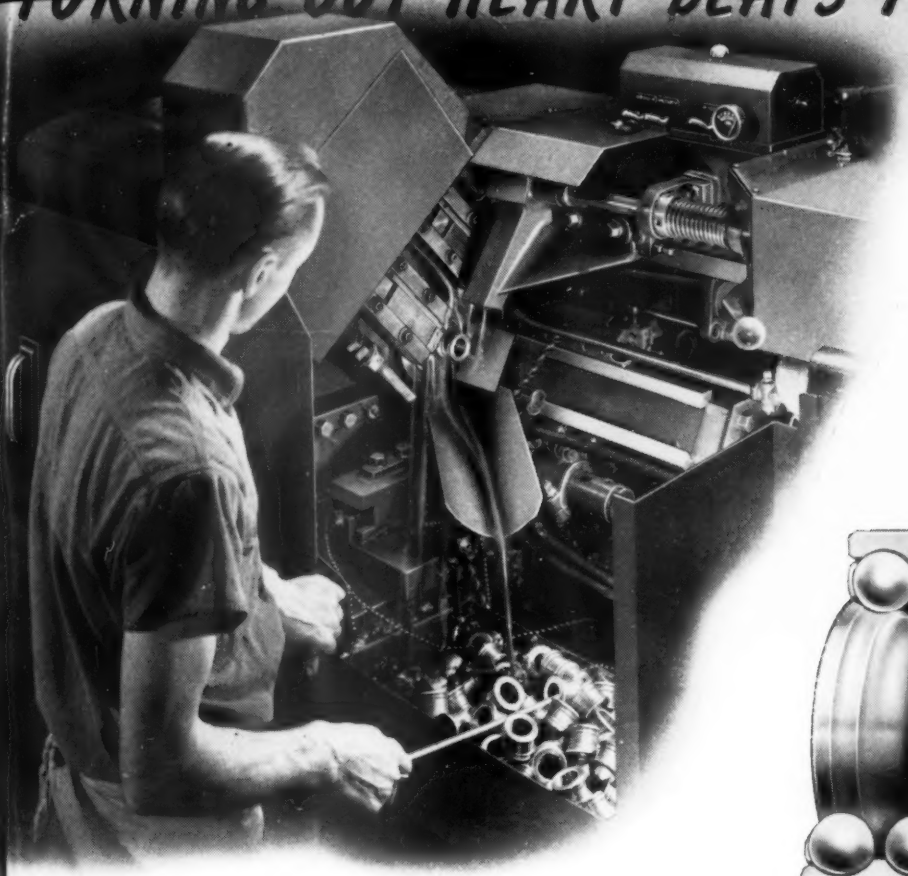
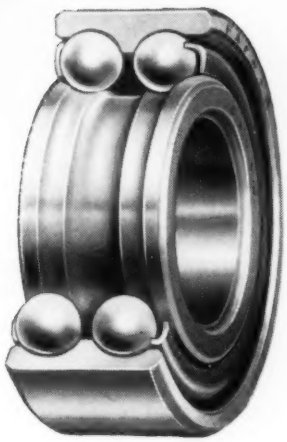
[illegible] HEART BEATS FOR BULLDOZERS





Fafnir inner rings for this #5206W bearing are machined to exacting tolerances at the large Fafnir plants in New Britain, Connecticut

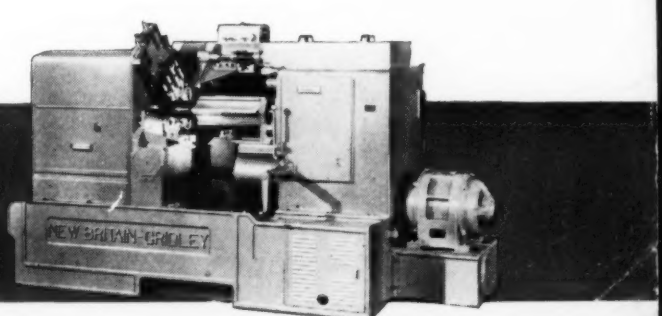
Few weapons of this war have won greater admiration than the versatile and powerful bulldozers. These modern giants are clearing jungles, building airstrips and destroying Jap pillboxes . . . making ready for new advances against the enemy. Behind this big push is a story of Fafnir Ball Bearing performance . . . guaranteeing smooth and dependable action of the gear pump mechanism which hydraulically operates the dozers. Failure of the gear pumps to respond would "kill this workhorse".

The model 61 pictured above is but one of the many New Britains turning out the inner rings of these Fafnirs for gear pumps since early 1940 . . . twenty-four hours a day, seven days a week with downtime held to a minimum. One cycle of the New Britain turns the outside diameter and the bore, forms both ball races, forms the recess between races and finishes both faces . . . speedily and accurately.

You too can profit from this same unprecedented performance in the competitive era just ahead . . . a period when price-per-piece will be an important factor in successful selling. It is to your advantage to discuss your production problems and requirements with the New Britain Sales-Engineer in your district. He has the automatic solution.

NEW BRITAIN AUTOMATICS

HE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
EW BRITAIN-GRIDLEY MACHINE DIVISION



01012

hard jobs are easy

when tools are made of Graph-Mo Steel

MAKING these End Caps for locomotive axles has proven that good tool and die design, skilled mechanics and performance-proven Graph-Mo Steel is the right combination to lick a tough job.

The End Caps are made of 3/8" thick 1015 steel. They are drawn 3 1/2" deep, machined to size and then pierced. Even though the presses groan in protest when they draw and pierce these parts, tools and dies made of Graph-Mo Steel give excellent trouble-free performance.

If you want to make hard jobs easy, use Graph-Mo or one of the other Timken Graphitic Steels, Graph-Tung, Graph-Sil, Graph-MNS or Graph-Al. These five performance-proven tool steels offer stubborn resistance to wear, excellent response to heat treatment, machine at least 25% faster and have less tendency to scuff and score than competing steels.

Graphitic Steels are available *now* from your nearest distributor or direct from Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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